No. 126, Original

In The
Supreme Court of the United States

DEPOSITION OF DALE BOOK, P.E.

STATE OF KANSAS,

Plaintiff,

v.

STATE OF NEBRASKA

and

STATE OF COLORADO,

Defendants.

Thursday, February 16, 2012

8:14 A.M.

PURSUANT TO NOTICE and the Federal Rules of Civil Procedure, the above-entitled deposition was taken on behalf of Defendant State of Nebraska at 1525 Sherman Street, 7th Floor, Denver, Colorado, before K. Michelle Dittmer, Registered Merit Reporter and Notary Public within Colorado.

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Preston Hartman
Tom Riley
Marc Groff
Jasper Fanning
Brian Dunnigan
Angela Schenk
Chris Grunewald

Also Present via telephone: Sam Perkins
Chris Beightel

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EXHIBITS (Continued) INITIAL REFERENCE

(Attached to original and electronic copy transcripts.)

REQUESTS FOR PRODUCTION

33,64,105,107,109,113,163,166,167,168,169,175

P R O C E E D I N G S

DALE BOOK, P.E.,

having been first duly sworn, was examined and testified as follows:

(Mr. Grunewald was not present at the commencement of the proceedings.)

EXAMINATION

BY MR. WILMOTH:

Q Good morning, Mr. Book. How are you today?

A Good morning. I'm fine.

Q Good. Could you state and spell your full name for the record, please.

A Yes. Dale Book, D-A-L-E, B-O-O-K.

Q Thank you.

There are a number of moving parts to your reports, and what I'd like to do is just introduce a number of the documents, get them marked, and then I think it would be easier to move back and forth between them as we need to.

MR. DRAPER: That would be fine.

Q (BY MR. WILMOTH) What I'd like to do first is just hand you a notice of the deposition and ask you if you have seen that document?

A Yes, I have.

Q And that document requests that you bring

any supplemental materials you might have with you. A couple of your colleagues did so in the last couple of days.

Have you brought any additional materials?

A Yes, I have.

MR. WILMOTH: We'll mark that Exhibit 1.

(Deposition Exhibit 1 was marked.)

Q (BY MR. WILMOTH) And I'd ask you if you can identify the additional materials for me.

A I brought a total of five items. Would you like me to list the items?

Q Let's -- why don't we take them one at a time.

A Sure.

Q And we'll mark them each as an independent exhibit. Does that sound reasonable?

A Two of them are just computer files.

Q Okay.

A On a flash drive.

Q All right. Why don't you start with the first document?

A Yes. The first document is an email from William Peck, passed on to me from Scott Ross, dated April 16, 2008.

Q And what's the nature of this document?

MR. WILMOTH: I'm sorry, John, for the record, is this a single document or copies of the same thing?

MR. DRAPER: I've given you all three hard-copy documents that Mr. Book is going to refer to.

MR. WILMOTH: Should we mark these as a single exhibit?

MR. DRAPER: Up to you. If -- they could be. Yesterday, we marked them all as one exhibit, but these are three separate documents.

MR. WILMOTH: Do they relate to the same subject matter?

MR. DRAPER: Well, they're -- I would say they're three different items that are further backup that we realized we needed to provide to you.

MR. WILMOTH: All right. So let's mark the first one, which is dated Friday, September 16, 2011, as Exhibit 2.

(Deposition Exhibit 2 was marked.)

Q (BY MR. WILMOTH) And why don't we start with that one, Mr. Book.

A Yes.

Q Could you tell me what that document represents?

A Exhibit 2 is an email from Ken Nelson,

passed on to me from Scott Ross, on September 16, 2011. This is a description that Mr. Nelson prepared at the request of Mr. Ross and me of the drain system in the KBID lands. It's entitled: KBID Drains.

Q All right. Thank you. And let's call the next document, which is dated Tuesday, November 1, 2011, Exhibit 3.

(Deposition Exhibit 3 was marked.)

Q (BY MR. WILMOTH) Could you explain the nature of that document, please.

A Exhibit 3 is an email from Sam Perkins, sent to Alex at Steve Larson's office, with a copy to our office. This is a tabulation of the groundwater acreage.

Of particular interest to me for my use was the Table 3 information on the -- starting on the second page, which lists the groundwater acreage for -- this is for the 10-2 corridor for each of the years '05 and '06.

Q All right. And the email, dated Wednesday, April 16, 2008, we'll mark as Exhibit 4.

Could you elaborate on its nature?

(Deposition Exhibit 4 was marked.)

A Exhibit 4 is an email from William Peck at the Bureau of Reclamation passed on to me through Scott Ross. This was dated April 16, 2008, and this provides

information related to the various reservoirs.

In the minimum pool are so-called contract acreages. This information was referred to in Table 6 of the report that I had prepared, analysis of measures.

Q (BY MR. WILMOTH) All right. Do you have additional materials?

A Yes, I do.

Q And are those on the hard drive?

A Yes.

Q Could you explain the nature of the files on the hard drive?

A Yes. I provided two Excel spreadsheets. The first one is an accounting sheet from the RRCA accounting draft for the year 2007. It is referred to as the Kansas Version of the RRCA Accounting for 2007, with a date of 8/8/2008. This file provides the source of information for 2007 accounting results.

Q And how has that been incorporated into your work?

A I believe it is included in either two or all three of the attachments in the report related to the Kansas losses. There are a series of attachments in that report describing the status of the accounting.

Q Is that the report that begins at KS 000355?

A Yes.

Q Thank you.

Do you intend to provide Nebraska that thumb drive?

A Yes.

Q All right. May we --

A Or loan it to you so you can pull the file off of it.

Q Very well. Very well.

MR. WILMOTH: If possible, maybe we could make a copy and provide it to you (indicating court reporter) as an exhibit then also.

Q (BY MR. WILMOTH) Is the file very large?

A That file is large. That's one of the RRCA accounting files that has a large number of pages in it.

Q All right.

MR. WILMOTH: Can we just go off the record for a moment to address this.

(Discussion off the record.)

Q (BY MR. WILMOTH) Mr. Book, we had a discussion off the record about the best way to make an exhibit out of the hard drive that you provided us. I understand you have a narrative description of what's on that hard drive. Could you just describe that for me?

A Yes, I do. This is a listing of the two

computer files that I've provided to you.

Q All right.

MR. WILMOTH: And we'll just go ahead and mark that as Exhibit 5.

(Deposition Exhibit 5 was marked.)

Q (BY MR. WILMOTH) Do you have any other materials, Mr. Book, that you'd like to share?

A No, I don't.

Q All right. Thank you.

As I mentioned before, I'd like to just introduce all of these reports, get them in as exhibits, and then we'll talk about them.

Before I do that, though, Mr. Book, is this a true and correct copy of your curriculum vitae?

A Yes, it is.

Q Thank you.

MR. WILMOTH: We'll mark this as Exhibit 6.

(Deposition Exhibit 6 was marked.)

Q (BY MR. WILMOTH) I'd like to hand you a copy of a report that I believe you prepared, ask you to identify it.

A This is a copy of the report entitled Engineering Analysis of Losses to Kansas Water Users from Nebraska's Overuse of Republican River Water in 2005 and 2006, prepared by Spronk Water Engineers, dated

November 18, 2011.

Q All right. Thank you.

MR. WILMOTH: So we'll mark that Exhibit 7, please.

(Deposition Exhibit 7 was marked.)

Q (BY MR. WILMOTH) For shorthand purposes, Mr. Book, would it be acceptable to you if I wrote at the top here "Book I" and then "Book II" and "Book III" on -- to mark the three reports, just for our discussion today?

A Yes, that's acceptable.

Q I'll put that in quotes at the top.

MR. DRAPER: So that Exhibit 7, you're going to call Book I?

MR. WILMOTH: Yes.

MR. DRAPER: Okay.

MR. WILMOTH: It's just a little easier, I think, to keep them straight.

Q (BY MR. WILMOTH) I hand you another copy of the second report and ask you to identify that.

A This report is entitled Requirements for Nebraska's Compliance with the Republican River Compact, prepared by Spronk Water Engineers, November 18, 2011.

Q Thank you.

And is it all right with you if I just mark

that as "Book II" --

A Yes.

Q -- at the top?

MR. WILMOTH: That will become Exhibit 8.

(Deposition Exhibit 8 was marked.)

Q (BY MR. WILMOTH) And I'd like you to identify that third and final report for me.

A This is entitled Analysis of Measures that Would Have Been Required for Nebraska to Achieve Water-Short Year Compliance with Republican River Compact in 2006, prepared by Spronk Water Engineers November 18, 2011.

Q Thank you. And if it's all right with you, I'll mark this as "Book III."

A Yes.

Q So what I'd like to do now is mark this as Exhibit 9.

(Deposition Exhibit 9 was marked.)

Q (BY MR. WILMOTH) And for the record, just to be clear, Exhibit 7 is what we will refer to as Book I, Exhibit 8 is what we will refer to as Book II, and Exhibit 9 is what we will refer to as Book III. Fair enough?

A Yes.

MR. DRAPER: Tom, for clarity also, it

might be helpful to give the Bates on which each of those starts.

MR. WILMOTH: Sure. So Exhibit 7, Book I, begins at KS 000355. Exhibit 8, or Book II, begins at KS 000435. Exhibit 9, which is Book III, begins at KS 000414.

MR. DRAPER: Okay. Thanks.

Q (BY MR. WILMOTH) Now, Mr. Book, I notice that you have copies of these reports yourself, do you not?

A Yes, I do.

Q And the copies that I have printed and marked as Exhibits 7, 8 and 9 were printed from the electronic version that was provided to us. But I understand that, looking at your versions, they have your professional engineer seal; is that right?

A Yes.

Q And your official version of the reports bears such a seal?

A Yes.

Q Why is that the case?

A I elected to stamp these reports as I prepared and submitted them. That's somewhat of a standard practice that we follow for 26(a)(2) Disclosures in our office.

Q And what is a 26(a)(2) Disclosure?

A Those are expert reports submitted for litigation matters. We generally work in water court proceedings in the state of Colorado where most of the cases that we're involved in involve 26(a)(2) Disclosures.

Q That bears your Kansas seal, though, does it not?

A Yes, it does.

Q So what are the engineering requirements in Kansas, in your understanding, for purposes of sealing your report like this?

A I'm not sure.

Q Do you know why you affixed your seal as the Kansas seal rather than the Colorado seal?

A Because I prepared this work for the State of Kansas, and I am a registered professional engineer in the State of Kansas.

Q But you're not sure of the sealing requirements in that state?

A Not specifically, no.

Q Now, neither Mr. Barfield's report nor Dr. Klocke's report bears such a seal. Why do you think that is?

A I don't know.

Q Have you reviewed those reports?
A I reviewed drafts of those reports. I did not review final versions.
Q Have you relied in any respect on either of those reports?
A No, I have not.
Q Neither directly nor indirectly?
A I've relied on discussions with Mr. Barfield indirectly and at the time of preparing one of my reports. To the extent the discussions we had are reflected in his report, that -- that reliance would be part of what's in his report.
Q Do you know the general nature of the analyses that were conducted by Mr. Barfield and Dr. Klocke?
A Yes, I do.
Q Can you briefly describe those?
A Mr. Klocke was providing a production function, basically, for the economists to use to calculate damages.
Mr. Barfield prepared a report discussing the outlook for future compliance with the Nebraska Integrated Management Plans, as well as some background and history related to the compliance by Nebraska.
Q Did you provide either of those two

individuals any assistance in developing their analyses?

A I was involved in a couple of meetings with Mr. Klocke, where I may have answered questions about the KBID system. I don't recall providing him any specific input. He was not relying on anything that I was doing, and he did not really ask me for any input onto the matters he was dealing with.

I had consultation with Mr. Barfield from time to time related to Nebraska compliance. I may have provided input regarding review of documents during the -- that were received from Nebraska in the production of documents.

Q So understanding that you haven't seen their final product, but I infer from your answers that you had seen at least some of the kinds of analyses that they were conducting -- is that a fair statement? You are aware of the kinds of analysis that they were conducting?

A I was not really involved very deeply in Mr. Klocke's analysis. I saw his report, but like I had mentioned, I was not asked to comment on it. And I did not provide him any input, so I guess I'd have to say I'm not real familiar with the details of his analysis.

Mr. Barfield's report, I am more familiar with the types of analysis that are involved in that

report as it relates to the results of the RRCA Groundwater Model and projections.

Q In your professional opinion and in your professional experience, would you conduct or employ those kinds of analyses without affixing your engineering stamp to them?

A I know that it is oftentimes done. I would say the rules are not real clear on the requirements for sealing or stamping what I refer to as 26(a)(2) Disclosures. And I'm aware that oftentimes reports are submitted by professional engineers without affixing seals.

Q And when you receive such reports, how do you view those that are sealed versus those that are not sealed in terms of their likely quality?

A It doesn't really affect my view of the product.

Q So what is the import then of the professional engineer's stamp as you see it? Does that impart any imprimatur of finality or completeness of review, or is it just a legal requirement?

A Well, in general, certain types of work product, designs, submittals to public agencies are required to be stamped. I don't think 26(a)(2) Disclosures fall in that category as clearly required to

be stamped.

I think our firm has -- has gotten to the point of, just as a normal course of action, providing stamps on the reports that we submit.

Q Now, your CV mentioned that you have conducted various analyses of return flows; is that correct?

A Yes.

Q Would you typically affix your seal to those analyses?

A Not -- not normally.

Q Even if you were using them to testify in Colorado water court?

A That practice -- I probably did not employ that practice going way back in time. I've been in practice now for 30 years. I've been submitting reports for Disclosures now for about 20 years. I have not stamped all of my submittals going back over the years. So no, not always.

Q How about when you develop augmentation plans as referenced in your CV; do you typically stamp those?

A Yes, generally now.

Q Why is that?

A The same thing. It's a 26(a)(2)

Disclosure, so it's involved in a -- an adjudicatory proceeding.

Q If it were not involved in an adjudicatory proceeding, would you still stamp those analyses -- or do you, I should say, still stamp them even if they're not involved in a judicial proceeding?

A Not normally. A lot of our work involves evaluations for clients, quantifications on a preliminary basis of what they could expect to receive in a transfer proceeding. Those types of reports and plans are not typically stamped.

Q I'd like to hand you a copy of an electronic communication that we located during our initial round of our arbitration. We'll mark this as Exhibit 10.

I'd like you to identify this communication, if you can.

(Deposition Exhibit 10 was marked.)

A This is an email from me to David Barfield and Steve Larson, dated June 26, 2003.

Q And what is the nature of the communication?

A This first paragraph indicates that this is based on the current, parenthetical '96 through 2000, groundwater depletions with dry-period surface water

depletions, calculating the comparison of consumptive use for Nebraska at Guide Rock with the allocation to determine a net overuse value.

Q And what was going on around the time of this email generally with regard to the RRCA and the litigation at the time?

A The indication on the email is that this is information David Barfield was preparing related to a press release, sometime around the signing of the final Decree, I believe. I don't know exactly, but this is mid 2003.

Q And I'd like you to read the first sentence of the email, if you would.

A "The Nebraska overuse could be upgraded by using the current (96-00) groundwater depletions with the dry-period surface water depletions to bring the drought period to present conditions."

Q Can you tell me what you mean by the word "upgraded"?

A I don't know for certain. I must be referring to some calculations that Mr. Barfield had prepared.

Q Do you recall what you were trying to achieve by upgrading the Nebraska overuse?

A My -- my thought here is that we were

probably trying to extend the current level of depletions because groundwater depletions continued to increase. So we were looking at the latest level of depletions available coming out of the groundwater model, comparing that with the dry-year period of allocation or water supply.

Q Now, in my mind, the term "upgrade" is equivalent to aggrandize. Were you trying to aggrandize the Nebraska overuse at that time by combining different periods?

A No.

Q What did you mean by "upgrade"?

A To extend the period to take advantage of more recent information. That's what the email indicates is that the -- the last number that I derive there was based on the latest five-year period out of the groundwater model for groundwater CBCU.

Q So you're just trying to employ the best available data at that time to make a more accurate calculation; is that right?

A Yes, I think that's a fair characterization.

Q I'd like to turn your attention now to Book I, if you will, and let's look at KS 365.

A I'm sorry, my report does not have a Bates

number on it, but I do have page numbers on the bottom of each page.

Q That's fine. This would be Book I, page 8.

A Thank you.

Q You have a reference there to the Glover method that you used to analyze return flows. Do you see that?

A Yes.

Q There's a couple of different references to Glover in your report. I believe this one is 1977. The second one is 1974.

Are those two different publications or is this just a typo?

A That may be a typo, if you can let me check the list of --

Q I think it's reference 11.

A Yes. I think the reference should be to the 1974.

Q All right. And in your backup materials, you provided us an electronic copy of Chapter 8 of that report; is that right?

A Yes.

Q And there are roughly 25 separate equations and 14 subsections in Chapter 8, and it's not clear to us which of those you're using. Can you tell me the

answer to that question?

A My recollection right now is that it's formula 8-23. That's the best I can recall at this point.

Q Thank you.

And you also provided a series of Excel files, but they included only the numerical results of your calculations and not the actual equations.

Can you describe the method from that Glover report that you used in these files? I've got a copy if you need one.

A Yes, if you have a copy available.

Q Let's see. This is my set. Here's a copy of the spreadsheets. You'll have to bear with me. As we discussed my copying woes, they are hopefully being worked out.

MR. WILMOTH: And we'll mark this as Exhibit 11.

(Deposition Exhibit 11 was marked.)

Q (BY MR. WILMOTH) Okay.

A I'm using the drain formula from Glover Chapter 8, which calculates the part remaining based on the inputs for aquifer parameters and distance. I use two distance parameters and I use two aquifer parameters, the S value and T value, transmissivity.

Q Okay. And can you tell me which values you've used?

A On page -- the first page here, which is Appendix D-2 of the report, we've used transmissivity values of 100,000 for the alluvial areas in KBID and we've used 35,000 -- these are in gallons per day per foot -- units. We used a value of 35,000 for the upland areas.

Q And does that cover the distance in aquifer parameters?

A We've provided the -- that does cover the aquifer parameters. The value of .2 is used for the storativity. I don't believe that's indicated on the table.

MR. WILMOTH: You catching all that okay?

THE COURT REPORTER: Yeah.

MR. WILMOTH: All right.

Q (BY MR. WILMOTH) And can you explain to us the processes Glover describes as local convergence losses?

A Well, that is probably a phenomena of the flow at a drain very near the drain, so that -- that would be a standard or a normal process of drainage where drains have been employed.

The Glover analogy that we're using here is

one that's specifically designed to analyze flow in drains, which would --

Q So does it include this --

A -- account for that, yes.

Q Okay.

A I don't recall the details of exactly how that would be accounted for.

Q But your understanding is that the method does account for local convergence loss?

A Yes.

Q And why is that an important thing to account for?

A Well, that's just a part of the process involved in draining a field with a drain. There's going to be flow in both the horizontal and vertical direction. And as you approach the drain itself, that flow is going to converge, and there probably is a loss associated with that process.

Q And does that water moving in a horizontal direction sometimes move up or down or is it always downgradient?

A It's always downgradient, but sometimes it may move up right around the drain itself. You're going to get flow both up and down as it converges on the drain. Flow will be downgradient, however.

Q In your backup materials, you also provided an electronic copy of Chapter 9 from Glover?

A Yes.

Q Did you utilize the methodologies in Chapter 9?

A Yes, we did. That was for the nondrain situation where we were calculating return flow timing to the Republican River. We had split the amount of return flow between the drain flow aspect where we used the Chapter 8 formula and the flows directly to the river, which was using the Chapter 9 formula.

Q Can you tell us which of the Excel spreadsheet files that were given to us reflect that analysis?

A I do have a copy of the list of files that I had provided to you. If you don't have one, I can --

Q I don't believe I do.

A -- pull that out.

Q If you happen to have one, that would be helpful. Thank you.

A I have not looked at these files for quite a while, but there is a file called Glover underscore KBID, and that's an Excel spreadsheet. There's a file called KBID return flows underscore 2011-11-5. I think the file should be included in there, in one of those

two files.

Q All right. And just for clarity on the record, that file listing accompanies the electronic files we received, correct?

A Yes, it does.

Q Thank you.

What does the Glover method assume about the aquifer involved with regard to homogeneity or differences throughout the aquifer?

A That it's homogeneous.

Q Does it make any assumptions about the size of the aquifer or the spatial dimension?

A Not the part where -- not the part that relates to the drain flow. That's really intended to cover a drain situation where you've got drainage to both sides. In general, Glover has an assumption about an infinite aquifer, though.

Q And does it make any assumptions about the elevation of the base of the aquifer?

A No, I don't believe it does.

Q How about the depth of the penetration of wells in the stream into the aquifer?

A I'm not evaluating wells here, so it's --

Q How about the stream?

A Typically Glover assumes full penetration.

Q Are there any assumptions about the interference of pumping from irrigation wells within the aquifer?

A No. The timing of return flows are independent of a separate interference, if you want to call it that, or impacts of pumping wells.

Q Does it make any assumptions about the water use of crops from the upward flow of water from a shallow water table?

A No. Glover is not a -- not a way that you would calculate ET from plants tapping the aquifer. Typically, if you're doing that type of analysis with Glover, you would have to make some sort of an independent analysis of water that would be consumed by that method.

Q Does it make any assumptions about the flow of water in the shallow water table?

A Not other than what we've talked about specifically.

Q Does it make any assumptions about stream bed conductance relative to the general aquifer properties?

A Yes. There's -- the assumption is that conductance is unimpeded, so impacts that are calculated can affect flow if there's flow in the stream.

Q We did try to locate a couple of files from what the -- excuse me, what directory was provided to us, and I wanted to hand you a description of some of the outputs and ask you if any of those look familiar?

A Yes, they do.

MR. WILMOTH: We'll mark that as Exhibit 12.

(Deposition Exhibit 12 was marked.)

Q (BY MR. WILMOTH) Now, can you just tell me what those files represent?

A Yes. Those are outputs, I believe, from the basic program that was used to calculate the drain, or it's possible that these are from the -- from the IDS AWAS program, which is reference 12 in my list of references.

Q Okay. Can you tell us what these files contain, each of those files represents?

A Not -- not right now I can't, no.

Q We also went ahead and printed off the contents of two of those files. See if this looks familiar to you.

MR. WILMOTH: Mark that as Exhibit 13.

(Deposition Exhibit 13 was marked.)

A Yes, this does.

Q (BY MR. WILMOTH) And how were the values in

these files generated?

A This comes out of the program that implements the process described on the equation in Chapter 8 and these represent, on a monthly time-stepped, the amount of return flow or drainage, if you will, from a unit of applied water during the first time step or first month. So, for example, the first one represents return flow of 86.9 percent during the first month.

Q First month of what?

A During the month of application.

Q So for a layperson, would that be like the month of May in your analysis?

A It would be -- it doesn't depend on a particular month. It's a unit response, so it's for the current month, the month of application. 86.9 percent becomes drain flow.

Q I see. And then in the second month, 99.976 percent becomes drain flow?

A Within the first two months, that's the cumulative total, yes.

Q I see. Thank you.

And did you provide a copy of that program that you used to generate these results?

A No, I did not.

Q Where would we find a copy of that program?
A I could provide that to you.
MR. WILMOTH: I'd like to request that that be provided.
MR. DRAPER: Okay. Very good.
Q (BY MR. WILMOTH) What does the term "sat depth" refer to? Do you see that?
A Saturated depth? Yes, I do.
Q What does that refer to?
A I'm not sure.
Q Do you recall what the source of your information might have been to generate those figures for sat depth?
A No, I don't.
Q Can you tell me what the term "perm" or P-E-R-M represents?
A Yes. That's permeability.
Q Is that different from the concept of transmissivity?
A It's one element of the transmissivity.
Q Could you tell me what the difference between perm is, as used in this file, and the concept of transmissivity?
A The transmissivity is typically the permeability times the depth of the formation that

you're dealing with.

Q Can you tell me what the value V represents?

A That's the storativity of 0.2 that I referred to earlier. Also referred to, I think, sometimes as void ratio.

Q And can you tell me what the source of that .2 figure is?

A I believe we obtained that information from the reference 14 or reference 15 in the list of references on page 10.

Q And for the record, that's KS 367. Did you conduct any independent evaluation of the parameters listed in these files?

A The information on the -- listed on the first page of Appendix D-2, the transmissivity values, were derived from the references, primarily reference 14, but also information contained in reference 15.

The information on the distances used was obtained from the email that I provided to you from Mr. Nelson on the density of the drainage infrastructure in the KBID lands. That provided an average drain spacing that was utilized.

Q Do you happen to remember which exhibit that was?

A Exhibit 2.

Q Thank you.

Mr. Book, I want to reference your attention back to the spreadsheet I provided you earlier. It's Exhibit 11.

A Yes.

Q I understand you prepared these files, correct?

A Yes.

Q Can I refer you to page 15. On the lower right-hand corner you'll see some page numbers. Do you see that page?

A Yes, I have that.

Q It says: Classified and Irrigated Acres in KBID?

A Yes.

Q Can you tell me what the columns P, Q, R and S represent respectively?

A This is a history of the acreage in KBID, splitting out the classified acreage above and below Lovewell with percents. I believe this is information from KBID.

Q You anticipated my next question, which is the source -- what was the source of the information?

A Yes. I have a footnote on the bottom of

the table that says: KBID annual reports.

Q All right. And what years did these represent?

A 1991 through 2010.

Q How did you use this information in your analysis?

A We used the classified acreage as the basis to develop the average or mean drain spacing that I referred to. I believe Mr. Nelson provided us with information about the total length of drains in the project, and then we used the total area using the classified acreage to convert that to a drain spacing, average drain spacing.

Q The values in columns R and S don't seem to add up to the value in column Q. Should they add up to that value or is there a reason for the discrepancy?

A I'm not sure what the reason for any discrepancy would be. This is just data that's contained in the KBID annual report. It appears to me that the totals are fairly close, but they may not agree on a year-to-year basis. I don't know the reason.

Q Okay. Would that have any effect on your analyses?

A No, I don't believe so.

Q Whether you used column Q or the sum of

columns R and S, you get the same result?

A I think the result would be essentially equivalent.

Q Just more generally speaking, do you think that the Glover method is the best method to analyze the drainage on an agricultural field, or I should say within an irrigation district?

A Yes. We did not have a groundwater model available for this area, and typically if you had an area where you had a MODFLOW application available, you may be able to get some improvement on the return flows back to the river.

However, that type of modeling would not help you where you're analyzing on-farm or within-district drain systems, such as what we have here. So if you were using a modeling approach, you would have to find some way to represent the on-farm drainage system, which I have not really seen done with MODFLOW.

This use of Glover, where you're evaluating on-farm drains, is a reasonable method in my opinion.

Q So the RRCA Groundwater Model domain doesn't extend to include KBID?

A No, it doesn't.

Q Did you consider any other alternative

types of analyses to analyze the issue?

A Yes.

Q Could you tell me which ones those were and why they were rejected?

A Yes. If you recall in our submittal on the arbitration proceeding, we made some very simplifying assumptions about the timing of the return flows of KBID, from KBID lands to the Republican River, which was based on my knowledge about the drainage infrastructure out there.

And in discussions I had had with Mr. Ross and Mr. Nelson, we decided, as we were preparing for this submittal, that we would check the sort of assumptions that we had made the first time around with an analysis of the drain spacing.

So the information we got on the aquifer characteristics and the drain spacing led to this analysis.

Q How did you go about collecting that information?

A Through the review of the available reports from the USGS that are referenced and through the information that was requested and provided by Mr. Nelson and through discussions with Mr. Ross related to his local knowledge in the district.

Q Did you participate in any field inspections or survey work on the ground within KBID?

A No.

Q I'm going to hand you a summary of a document. I will represent to you that I obtained this from the evil empire of Amazon.com, which is killing all of our local book stores, which my wife constantly reminds me as she works through her editing career.

I would just ask if you have any familiarity with this particular document or these authors.

MR. WILMOTH: We'll mark this as Exhibit 14.

(Deposition Exhibit 14 was marked.)

A I don't specifically recall this. This has the feel of something I've seen in the past based on the name, but -- and the authors, but it's not -- it's not a document or a reference that I specifically recall.

Q (BY MR. WILMOTH) Do you recognize the authors?

A The names, I have seen in the past, but I'm -- I'm not familiar with either of these two editors.

Q You're not familiar with their work?

A No.

Q Okay. Could you take a look at the tables of contents there, which I also printed off, and I would just ask you if you think any of those titles could be relevant to your work? I know you don't know the content of the chapters, but do the titles look as though they might apply?

A There appear to be a couple of sections here that would relate to the type of drainage analysis that I did. One is called "Modeling the Performance of Drainage Systems" and one is called "Water Table Control."

I don't see anything else on here that --

Q All right. Thank you.

A -- appears relevant.

Q You can keep that one.

I'd like to hand you one more reference and ask you the same series of questions. This is Exhibit 15.

(Deposition Exhibit 15 was marked.)

Q (BY MR. WILMOTH) Specifically, do you recognize the nature of this document?

MR. DRAPER: Do you have an extra copy of that?

MR. WILMOTH: Yeah. Sorry.

A No, I do not.

Q (BY MR. WILMOTH) Do you know when the Glover method was actually published, first published?

A The reference that we use is 1974.

MR. DRAPER: Tom, was this marked as an exhibit?

MR. WILMOTH: Exhibit 15.

MR. DRAPER: Thank you.

Q (BY MR. WILMOTH) Just looking at the title of that document and the description, Mr. Book, does it look like it might be something that would be relevant to your analysis?

A I'm not sure if this would be helpful or not. It appears to be a design manual to make drain designs.

Q All right. Thank you.

Can I turn your attention back to Exhibit 11, which was the spreadsheet that we printed off?

A Yes.

Q Page 1 of that spreadsheet reads "Appendix D-2" at the top?

A Yes.

Q Can you explain to us what's included in that spreadsheet there -- excuse me, in that sheet?

A Yes. This is a list of the data from the

reference cited on the bottom, Fader, 1968. And this contains, for a series of wells, the location, geologic source, transmissivity and the type of test. I'm not sure what the "type of test" refers to.

Q And I asked you earlier whether you had conducted any field analyses in KBID.

Did you conduct any field analyses to determine the actual soil or aquifer properties within KBID?

A I did not do any field analysis, no.

Q With respect to column M, the transmissivity values --

A Yes.

Q -- do those values support an assumption that the aquifer is homogeneous?

A I believe it would be difficult to determine that from the transmissivity because you don't have the depth parameter included here.

Q Are the --

A This reflects a combination of permeability and depth at any particular point, so --

Q Does the depth parameter appear anywhere in this spreadsheet or any of the other material?

A It does not on this page. I'm not sure if there's more information in the reports or not that

would indicate that. I don't recall.

Q If you had that information, could you answer my question?

A Based on the description of the area contained in the two reports, I would consider this an area that would be suitable for application of the Glover and homogeneity requirement.

Q What do you base that opinion on?

A The description of the aquifer, that it's the alluvial aquifer of the Republican. And it's generally a uniform-type aquifer, similar to other systems that I've worked on.

Q Let me take you to page 19 of the spreadsheet. I think earlier you made reference to this value SY in our conversation in column D?

A Yes.

Q Could you tell me what that represents?

A Well, it's referred to here as the specific yield.

Q And how is that value determined?

A Again, I believe I obtained that from the information in the two reports, the Fader report and the USGS report.

Q Are these references 14 and 15?

A Yes.

Q Do you expect that value to vary over the area of an aquifer?

A No. Typically that's a pretty stable value that's used for modeling purposes.

Q And what value did you select?

A The 0.2 value you mean?

Q Yes.

A That's the value.

Q And the basis of that selection again was the references 14 and 15?

A Yes.

Q Earlier I directed your attention to page 1, and we had a discussion about column M on the transmissivity values. If the transmissivity values vary as they do in column M, would you not expect them to vary in column D on page 19?

More specifically, would you not expect the value of SY to vary?

A I would not expect the value of SY to vary. Transmissivity, there will be variation throughout an aquifer, but we selected a mean transmissivity.

Q The .2 value is a mean?

A No. That -- that value is not going to vary. That's the value we obtained from the report, the two reports.

Q So how does the value of .2 relate to the mean transmissivity value that I understand you selected?

A I don't -- I don't have that as a relationship. The two are separate parameters.

Q Is there any method by which those two could be related?

A There may be.

Q Do you know of any?

A Not right here, right off, without doing some research on that.

Q Mr. Book, I'd like to hand you the ASABE document. The first page and the fourth page -- I'm really only interested in the fourth page. I do have a copy of the complete document, if you'd like to see it.

MR. WILMOTH: We'll mark this as Exhibit 16.

(Deposition Exhibit 16 was marked.)

Q (BY MR. WILMOTH) Are you familiar with the ASABE?

A Not specifically, no.

Q You don't know what that organization does?

A No, not specifically.

Q You're not a member of that organization?

A No.

Q Are you familiar with any of the standards the organization employs?

A I don't believe so.

Q So you don't rely on any of those standards?

A No.

Q I'd like to turn your attention now to Appendix D-5 of your Book I report. That would be towards the back.

Could you explain to me generally what this appendix includes?

A This is a derivation of the distance parameters that we used for the drain part of the analysis. This shows the transmissivity value, the specific yield value, and the average drain spacing, and then the X parameter that was used in the formula.

Q What is the general nature of the drains within KBID? I mean, physically, are they corrugated plastic tubing that are installed below the surface or are they open drainage ditches? How do they look on the ground?

A It's pipe drain. They're more than corrugated plastic. They have been in place for probably 40 to 50 years. I envision them as large concrete drains on the order of 10 to 12 inches

possibly, constructed by the Bureau of Reclamation.

They were supplemented by KBID in specific areas, as indicated by Mr. Nelson. I envision that aspect of the drainage as probably a little more of the 4- to 6-inch clay tile pipe type drain.

Q You mentioned that you envisioned them being that way. Have you not seen them actually?

A No, I have not. That's information I got from Mr. Ross and Mr. Nelson.

Q What does the column entitled "Drain Length" represent on the Appendix D-5?

A That may be a prorated number between the above and below KBID. Mr. Nelson provided us with a total distance.

Q So that's like a linear footage of drainpipe?

A Yes.

Q Okay. And is this reference here in Note 4 one of the documents you provided us today?

A Yes.

Q All right. What does the column entitled "Average Drain Spacing" represent?

A That should be the area divided by the drain length. It's the average distance between drains in the KBID service area generalized, based on the total

area that we had -- I believe that came from the information we were looking at earlier on the authorized acreage and using the length that Mr. Nelson had provided.

Q So that's just a calculated value, and it assumes that the drains are equally distributed throughout the district at that spacing?

A I don't know that we have to go to that -- that assumption, but it's certainly an average spacing based on the total area, the total length.

Q Would you expect the drains to be variable then on the ground, the distance would be variable on the ground?

A Yes.

Q Any idea what the scope of that variation might be?

A No.

Q Would you expect spacing like that to be appropriate for this area and this district?

A Yes. These were designed drains so the U.S. Bureau of Reclamation -- as I understand, it was a significant effort after the project had been in place for a while and the drainage problems became apparent, that the Bureau invested a substantial effort in the design and construction.

Q Let me turn your attention to Appendix D-6. I think D-6, 7 and 8 all talk about various Glover results. Can you tell us what these appendices represent?

A Yes. These are basically the response functions which display the return flows as percentage, so these are unit -- unitized response functions, just displaying the results over a period of months.

And so we've got individual monthly values and then cumulative curves on the bottom. And these represent the results for the alluvial aquifer representation, as well as the on-farm drain representation, which is Appendix D-8 and D-9.

Q And how did you incorporate these curves into your analysis?

A We used unit responses to make calculations of the timing of return flows to the Republican River. We weighted the areas. I believe we used 75 percent drain and 25 percent nondrain, which we applied the alluvial aquifer results.

Q How did you arrive at those statistics, 75 percent drain, 25 nondrain?

A The 75 percent drainage was an assumption based on the descriptions that Mr. Nelson and Mr. Ross had provided and an approximation of how much of the

return flows were affected by or delivered through the on -- through the drainage infrastructure in the district.

Q What functions from the Glover analysis did you use to create these?

A Well, the Glover analysis generates a timed series of return flows, and we are using a monthly time step.

Q Monthly time step.

Are those calculations represented in the report or on any of the supporting materials?

A They should be in the spreadsheet backup we provided to you.

Q In the spreadsheet that's Exhibit 11?

A As I mentioned, there were two spreadsheets with return flow results, and based on what you provided me here, I don't see it in this spreadsheet.

Q Could you just identify from your notes the files to which you are referring?

A In reviewing Exhibit 11, I do see some results of the depletion analysis, which are used to generate these curves, back starting on page 21 of this document. So I believe all of the information is contained in this document to generate the unit response functions.

Q Thank you.

Mr. Book, I'd like to turn to your CV for a moment, if I may. And I have my additional copies. We've already marked this, I believe, as an exhibit, have we not?

THE COURT REPORTER: Yes. It's Exhibit 6.

Q (BY MR. WILMOTH) Exhibit 6. I've got extra copies, if you'd like.

Mr. Book, your CV notes you've got experience developing augmentation plans. Could you generally describe that experience for me?

A Yes. Augmentation plans are the means for developing new water sources in Colorado or for providing replacement for existing wells.

Typically, because it's -- if the source is groundwater and it's developed with wells, then you have lagged effects on the streamflows that need to be accounted for and replaced at times when there aren't senior water rights needing water.

So the plan for augmentation is a means to incorporate a replacement source of water, either retired irrigation rights or storage water generally, to provide a program to replace -- calculate and replace stream depletions caused by pumping wells at the available sources.

Q So physically, what do these typically involve on the ground?

A Typically, it's a water supply system, either municipal or irrigation are the typical applications with individual wells to multiple wells. And water is used through a system, either an on-farm irrigation process or through a municipal system and generates return flows.

So one component of the augmentation plan would be return flow documentation and measurement to determine the depletions caused by the well pumping. In addition to that, you would then have replacement sources of water available, which could involve storage -- storage water or transferred ditch water. That's the typical augmentation plan.

Q Could you just explain the basic steps that you engage in when you work to develop an augmentation plan?

A There's two basic steps. The first is to develop what the depletion characteristics are going to be for the source wells for the water supply. That typically involves analysis of impacts on streamflow. Typically, it's based on the alluvial river systems. It's based on a Glover-type formula and unit response functions.

Q You don't typically utilize groundwater models to conduct those analyses?

A No.

Q Sorry, I interrupted you. There's another step?

A The other -- the other component is then the replacement supply, and this involves identification of the amount of water, identification of potential sources of water, acquisition of sources of water; and if it's a water right that has been previously used for irrigation or some other type of use, it will involve a change of water right proceeding to quantify the available -- we refer to it as consumptive use credit, which then is available to replace net impacts.

Q How do you typically go about identifying the scope of the water need or the water that needs to be offset?

A Based on the demand of the project. This can range anywhere from an individual farm, an individual private user for a -- some type of a commercial operation to a large subdivision, where you will be analyzing wellfields. But it's demand-driven and well -- based on where your wells are located.

Q When you're quantifying that demand, then do you interact with the project proponent and try to

understand what they're trying to achieve, I assume?

A Yes.

Q You mentioned earlier the documentation and measurement of return flows. Do you typically take actual measurements of water use or consumption or return flows to validate your assumptions?

A We'll normally use -- you will normally use the best information that you have available related to return flows. Oftentimes that involves field observation. Irrigation return flows are difficult to measure, so it's not usually a measured component.

If you are dealing with a municipal system, return flows are a measured element of effluent oftentimes, which is measured.

Q When you're analyzing return flows generally, can you just explain the basic steps that you undertake to do that?

A Are you referring to irrigation return flows or --

Q I'm actually referring to the analysis you conducted in your CV -- referenced in your CV. On page 4 of your resume or your CV, you've got lawn grass irrigation return flows?

A Oh, yes.

Q So my question is just, could you describe

the general steps that you engaged in in that analysis?

A In that specific analysis, there was a program in place over a number of years to quantify the amount of return flow from lawn irrigation. We call it a lysimeter program.

There were a number of these implemented around Denver back in the 1980s. The purpose was to come up with a more accurate estimate of basically irrigation efficiency of lawns. So it was based on measured input. To lysimeters, what was the measured return flow and how did that vary with the amount of application.

Q Why did you employ lysimeters in that case?

A At the time, the issue of lawn irrigation return flow credits was somewhat -- I don't want to use the word "controversial," but it was subject to quite a bit of scrutiny, and there were questions among the water users on the river about whether there was any return flow from irrigation on lawns and to what extent that occurred. Hence, the data collection program.

Q And did that data improve your understanding of the issue?

A Yes.

Q What did you conclude?

A That it's variable and it depends on the

amount of water that's applied. When you're dealing with a municipal water supply system, it's different than dealing with irrigators, who are more focused on management. And so you see a broader range of return flow characteristics from zero to large quantities.

Q What's the value of utilizing a lysimeter over some other field measurement device?

A It gives you a point measurement. It's somewhat limited because you're dealing with obviously a small area with a lysimeter. So the issue then becomes the representativeness of it, and you have to make assessments about the number of lysimeters that are needed to provide sort of the mean information that you need to run the program.

Q Does a lysimeter measure return flow, generally?

A It can. The primary purpose of a lysimeter in the more conventional use is to measure ET, but you have a mass balance on the lysimeter.

So the return flow is another element that's measured depending on how you're operating the lysimeter. Some lysimeters are not intended to measure return flow. Others are based on the way the drainage is handled.

Q Are there other devices or mechanisms that

can be employed to measure return flows?

A Not that I'm aware of.

Q How do you typically measure the return flows from an agricultural field?

A You make engineering calculations.

Q Your CV also notes you've got some experience supporting and analyzing water rights claims.

Is that -- am I understanding that correctly?

A Do you have a specific cite?

Q Well, I'm inferring from your work on behalf of Eagle County, for example, and the City of Pocatello, Idaho, that you have conducted that work.

A The work specifically for Eagle County is primarily water rights protection work, and it relates to augmentation plans and water rights transfers. There are not very many places in Colorado where there are new water rights claims being made. It's more in the --

Q Sure.

A -- in the realm of changes in augmentation plans.

On the City of Pocatello, we do assist them with ongoing worked in the Snake River Basin adjudication, which is largely water rights claims, so that specifically relates to that client.

Q How about your work for the Department of Justice?

A Again, that is specifically related to water rights claims that were filed in the Klamath Basin, and we were assisting the Department of Justice in evaluating those claims as part of an adjudication process.

Q Okay. And what are the typical steps that you undertake to substantiate or validate a water right claim?

A To -- typically, the water rights claims you're dealing with in these adjudications are for water rights that are already in place and operating or had been at some point in the past.

So in large part, it's a historical use analysis based on records, information from the field, interviews with users, interviews with state water administrators, to determine the validity and the extent of the water use and relate that to a claim that is being made.

Q Okay. Very good.

MR. DRAPER: Can we take a break?

MR. WILMOTH: Yes. Let's take 15 minutes. Come back at 10:00.

(Recess taken from 9:48 a.m. until

10:04 a.m.)

Q (BY MR. WILMOTH) I'd like you to turn to your Book I report, if you would.

A Yes.

Q And the report begins by explaining your intent to analyze the reduced water supply to the State of Kansas caused by overuse of Nebraska's allocation on the Republican River in two years, right?

A Yes.

Q What analysis did you conduct to determine that Nebraska's overuse was the proximate cause of the reduced water supply?

A The purpose of the analysis is to determine what the impact was of the Nebraska overuse. So the quantity of the overuse reduced by losses to the stateline represents the amount of water that we are evaluating here.

It's a direct relationship between the amount of overuse and the amount of water at the stateline if you're accounting for losses.

Q Did you make any independent determination of the fact that Nebraska was the proximate cause of all of the reduced water supply, or was that an assumption?

A We are only quantifying the reduced water supply attributable to the overuse, so it's almost by

definition. First we quantify the overuse, and then we quantify the impact of that amount of overuse.

Q So your assumption is that all of the overuse resulted in a reduction in -- of use in KBID?

A Generally speaking, that's the concept. However, as I noted, we did account for losses. I did state the assumptions in the report that the water was available through Harlan County Reservoir.

And based on the level of water involved and the level of water that had actually been delivered to KBID, it was my conclusion that all of the amount of overuse could have or would have been used by KBID in these two years.

Q Did you consider any other factors that might have reduced the supply available to KBID?

A No.

Q Did you consider anything like KBID board decisions or voluntary decisions made by Kenny Nelson or other members of the District?

A No, I did not.

Q A little further down there, you explain that the purpose of the report was to determine how the water supply unavailable to the State of Kansas would have been used if Nebraska had been in compliance.

With whom did you speak in KBID about that

issue?

MR. DRAPER: Are you referring to a particular page of the report?

MR. WILMOTH: Page 1.

MR. DRAPER: Okay. Thank you.

Q (BY MR. WILMOTH) Bottom of the first paragraph.

A In KBID, I spoke with Ken Nelson, and there's one other gentleman on the staff there. I don't recall his name right now.

Q Did you speak to any members of the board?

A No.

Q Did Mr. Nelson tell you he would have used a full supply, had it been available?

A I don't believe he spoke in terms of full supply.

Q What did he tell you?

A He told me that they did not have enough water. Those were two water-short years, and additional water would have been used.

Q Did he tell you he would have used all the water that you've calculated?

A No.

Q Did he tell you he wouldn't have used all that water?

A No.

Q How many farmers outside of KBID did you speak with in conducting your analysis?

A I believe about four.

Q Where were they located?

A On the Republican River between the stateline and Concordia.

Q Could you tell me their names?

A No, I don't recall.

Q Do you know when you spoke with them?

A Yes.

Q Could you tell me?

A I believe it was in December of 2010.

Q What did they tell you?

A They told me the general conditions on the Republican River as it related to use of water from the river, both for well pumping, as well as surface water diversions.

I think the information they described was related to cropping types and to operations and to issues related to river flow and to issues related to water rights administration.

Q Were all those farmers present and farming in 2005 and 2006 at those locations?

A Yes.

Q So when they told you about these issues, were they speaking about those issues as of 2005 and 2006 or as of 2010?

A They were speaking about conditions related to the timeframe that we were inquiring about, which was 2005, 2006, and to conditions prior to that, when there was more water in the river, and to conditions since then.

Q How would I go about finding out who these individuals are?

A Mr. Ross attended the meeting.

Q Did he schedule the meeting?

A Yes.

Q Did he identify those persons for you?

A He was the one who determined who would be present at the meeting, I believe. I didn't.

Q Do you know what the basis of his determination was?

A General knowledge of the Republican River below Hardy.

Q Did you use any standardized questionnaire?

A No.

Q Were there any written minutes of those meetings?

A No.

Q Did you receive any information from any of those folks in the form of written communications?

A No.

Q Did you take any notes of those meetings?

A Yes.

Q Have they been provided to us?

A No.

MR. WILMOTH: Could I request copies of those, Mr. Draper?

MR. DRAPER: Yes.

Q (BY MR. WILMOTH) A bit further down, at the bottom of page 1, you indicate that the actual water supply available to KBID was limited by the water in storage in Harlan County Lake; is that correct?

MR. DRAPER: Which paragraph is that?

MR. WILMOTH: Last paragraph, last sentence.

A Yes, that's a correct statement.

Q (BY MR. WILMOTH) Does that mean that you assumed KBID would have taken all the water available to it in Harlan County Lake in '05 and '06?

A No.

Q What was your assumption about that?

A Well, they took what they took, and additional water would have provided them the water

supply to make runs during the irrigation season to use the water that Nebraska would not use if they were not overusing.

Q Would they have left any water in Harlan County Lake?

A No. As I previously stated, based on the amount of water available and the historical use in KBID, I don't believe so.

Q So they would have used all the water that would have been available in Harlan County Lake?

A No, I didn't say that. They would have used the additional water that would have been available from the Nebraska overuse.

Q Okay. Is that equivalent to all the water that is legally available to KBID?

A I believe in one of the years, the reservoir was drained down to the -- the minimum that it could be taken during the irrigation season. I don't recall for the other year, so no, not necessarily.

Q Is there some block of water in Harlan County Lake that KBID would not have taken in your hypothetical?

A I don't know. I didn't analyze that.

Q Do you know if KBID has ever decided to leave water in Harlan County Lake that would have

otherwise been available to it?

A They do leave carryover in the reservoir from time to time.

Q Do you know whether KBID elected to leave any water in Harlan County Lake in 2005 and 2006?

A As I said, I believe in one of the years, it was drained down as far as it could be taken, and I don't remember the situation in the other year.

Q Assuming for the sake of argument that KBID elected to leave water in Harlan County Lake in 2005 and 2006; how would that affect your analysis?

A Based on the amounts of water that were taken and the amounts of water available, that would not affect my analysis.

Q You proceed in your analysis to conclude that the additional supply that would have been available would have produced additional streamflow at Hardy and downstream of KBID; is that right?

A Yes.

Q And you conclude that would have resulted in additional diversions?

A Yes.

Q With whom did you speak about their likely diversions of return flows in those areas?

A I spoke with Mr. Ross and I spoke with

Mr. Pope and I spoke with Mr. Barfield. I think that's it.

Q And do you recall their general response to your inquiries about that matter?

A It's been some time now, but the general response was that there are active diverters in that section of the river. There were significantly low stream flows in that stretch of the river for the two years.

Additional water would have been diverted subject to MDS constraints that were in place in those two years.

I think those were the main things that I was told.

Q Did you attempt any independent verification of the likely behavior of those diverters?

A Yes.

Q What was that?

A That's the analysis that we describe and tabulate in the report related to the listing of water rights for active diverters in the reach.

Q And that's included in your report?

A Yes.

Q On page 2 of your report, you note that additional flows would have reached Milford Reservoir

downstream in Kansas. Is that reservoir located in the Republican River Basin as defined in the Compact?

A Yes.

Q How is the water in Milford Reservoir used?

A They have a water bank, a municipal water bank, and there's water contracted for out of Milford. In addition, it's used for recreation. Those are the uses that I'm aware of.

Q Did you attempt to quantify the shortage of water that would have otherwise theoretically reached Milford Reservoir?

A Yes.

Q What is that figure, or I should say what is that amount?

A On Table 4, which is page 26 of the report, there is a bottom-line number, which is called Total Remaining Additional Flow. And this is the net outflow at Clay Center, which is essentially return flow water that would have been remaining in the river at Clay Center after deducting the diversions that we documented above.

That flow would probably be a little bit low because the diversions that we're describing in row 9 would have generated additional return flow on top of those.

Q Is this -- what's that figure? What is that number?

A The total for the two years is 27,917 acre-feet.

Q Is it your understanding that the State is seeking any relief for damages based on that water?

A I'm not aware of any quantification. I don't know what all of the potential claims for other considerations might be, but in terms of numerical economic analysis, I'm not aware of any. I was not asked to help with any.

Q So your understanding is that that figure is not included in the economic analyses that Dr. Hamilton performed, for example?

A That's correct.

Q Thank you.

Now, at the end of this introductory section, you note that the results of your analysis were provided to the Kansas economists for purposes of computing economic losses to the State of Kansas due to the shortages caused by overuse in Nebraska.

Can you tell me your understanding of the relationship between your work and the economists' work?

A I provided Mr. Hamilton with the quantities of water diverted -- that would have been diverted to

the fields in KBID and the quantities that would have been diverted by the water rights that we identified on the Republican River.

Q And did you have any further involvement in their utilization of that information once you provided the initial conclusions?

A No.

Q Turning to Section 2 of your report, you note that the Courtland Canal is often operated outside the irrigation season to move water into Lovewell Reservoir; is that right?

A Could you show me which sentence you're referring to?

Q I don't know that I'm referring to a particular sentence so much as this Section 2.

Why don't I just ask you if that's an accurate fact?

A Well, the concern I had with your question was the term "often." I wouldn't characterize it as often --

Q Okay.

A -- because that's not the normal operation.

Q When does it typically occur?

A When they're water-short.

Q And how is that done? Who makes the

request?

A I believe the District makes the request.

Q KBID?

A Yes.

Q And do you know the mechanics of that? Does KBID request the Bureau to release water from Harlan to put into Lovewell during the period outside the irrigation season?

A No.

Q How does that work?

A There is -- my understanding is, there's no water released from the reservoir during the winter season, so diversions would be of river flow at the request of the District.

Q So this is just natural flow?

A Yes.

Q So that discussion in Section 2 doesn't contemplate the movement of stored water then?

A Not -- not during the off-season, it does not. That's correct.

Q Thank you.

On page 3, you refer to Bureau records as evidencing the number of acres irrigated in 2005 and 2006, but I didn't see a citation. To which records are you referring?

A The Bureau records that I'm referring to are either reference No. 2 or reference No. 3. The operating plans, I believe, contain the information on acreage, and I believe the information we received from the Bureau did as well.

Q Has that Bureau information been produced in association with your report?

A All of that was information that had been produced previously, and I don't believe we included it in the spreadsheets again at this time.

Q When you say previously produced, do you know when they were produced?

A In the production of documents for the arbitration proceeding.

Q Do you know what the date or vintage of those operating plans is?

A I believe there's an annual operating plan that's generated, and I know that the Bureau tabulates summaries of the records and other files, but I believe the annual operating plans would only contain either the current year or current year and prior year for each -- each report.

Q So were you relying on the 2005 operating plans of the Bureau and the 2006 operating plans of the Bureau?

A I don't recall specifically which -- which source it came from.

Q Is there any way that you can determine that?

A Yes. I'd have to go back and review the data sets.

Q What are those --

A It may be documented in the spreadsheet that you have.

Q All right. Do you know what those records are based on, the Bureau records?

A Not specifically, I don't. I think the general process is for the District to report the acreage to the Bureau, but I don't know any more detail than that as to how the Bureau compiles that information.

Q Do you consider that a reliable source of information, though?

A Yes.

Q Now, you note that an average of 6.9 inches was delivered in '05 and '06. Do you know how much was delivered in each year?

A Yes, I do.

Q Can you tell me?

A That information is provided on Table 3 of

the report, which contains -- the first block of information is the actual, and so this represents the farm deliveries and the acreages.

Q I beg your pardon. Table 3?

A Table 3 on page 25.

Q And do you know what factors go into KBID's determination of how much water to deliver in a given year?

A Generally I do, yes.

Q What are those factors?

A Generally, the District operates on a full supply basis, which means that the irrigators receive as much water as they want or need. They consider a base allocation of 15 inches.

They have flexibility, that irrigators can obtain water above 15 inches at times. They will evaluate water supply conditions, and if it looks like there are water-short conditions and provide notice to the irrigators, if it appears that they will not be in a full supply; this then could lead irrigators to evaluate water supply conditions and their needs.

Q Does precipitation play any role?

A Precipitation plays a role on a scheduling basis. I'm not sure that precipitation has a big effect on the total volume taken for the year. It's more when

they take the water that's going to be affected by precipitation.

Q And how does precipitation affect the schedule of water deliveries?

A My understanding is that if significant rainfall is occurring, that deliveries can be regulated or postponed or turned off during those types of events.

Q And why would that be necessary or appropriate?

A Just because irrigation supply would be reduced in the short term due to a significant rainfall event.

Q Irrigation supply would be reduced or irrigation demand would be reduced?

A The irrigation demand for supply, excuse me.

Q Is that because part of the crop irrigation requirement is being met with the precipitation?

A Yes.

Q Are you aware of any situations in which the State of Kansas contracts to maintain water for fish and wildlife in Harlan County Lake?

A No, I'm not.

Q Still in Section 2, you explain that return flows from the Courtland Canal and the KBID service area

reach the Republican River and its tributaries and they're available for diversion or recharge to the alluvial aquifer downstream.

This is in Section 2, page 3, above 3.0, last sentence.

A I see that now.

Q We'll get there.

A We're there.

Q On what do you base that opinion?

A My knowledge of the system out there, the river, and the KBID service area. The review of the reports that are listed in our references, primarily 15, I believe; the USGS report; the discussions that I referred to previously with Kansas officials; and just general hydrology knowledge of the way that irrigation and return flows are going to operate.

Q In speaking with those folks that you referenced, did you garner any information that would allow you to determine how much of the return flow reaches the Republican River and how much reaches the tributaries that you're referring to?

A I don't recall any specific information that they provided. One exception may be Scott Ross's description of the drains, which are going to be connected to the tributaries up in the service area. So

that information helps make that determination.

Q Did you break out how much return flow is reaching the river proper and how much is reaching tributaries?

A I don't believe we did, no.

Q Would the answer to that question affect which individuals could actually use the water outside of KBID?

A We were limiting our analysis to users on the river itself and on the tributaries in KBID, to the extent there were any.

So physically, the return flows would be available to diverters below the KBID service area, whether it's on a trib or on the Republican River.

Q Would it have any bearing on who within KBID could use it?

A No.

Q Would it affect the timing of the return flow reaching those users outside of KBID?

A Could you repeat what the primary question is we're answering?

Q Sure.

If return flow that you're referring to here reaches a tributary versus the mainstem, does that affect the timing with which that water ultimately

reaches users outside of KBID?

A Well, the timing is a function of where return flows accrue to the system. I'm analyzing return flows at the point of flow, whether it's in the drain on the service area or in the tributaries. It's to the nearest flowing tributary or to the Republican River itself. Certainly the timing would affect when it could be diverted.

Q So if the return flow you're referring to reaches a tributary, does that -- is it possible that the water reaching that tributary would take longer to manifest in the area below KBID than water reaching the mainstem?

A No.

Q Okay. That's irrelevant?

A It's --

Q Is that what you're saying?

A No. It's not possible.

Q What's not possible?

A That the water reaching a tributary would take longer to reach the river than groundwater deep percolation that's reaching the river directly.

Q Okay. That wasn't exactly my question, I guess. Let me try this again.

I understand from your statement here that

some of the water that you consider return flow reaches the Republican River directly and some of it reaches a tributaries -- a tributary or multiple tributaries of the river; is that a correct understanding of your statement?

A Return flow would accrue to a certain location whether it's a drain or a tributary or the mainstem of the river, and some combination of all those occurred.

Q And when you're trying to determine when that return flow would reach users outside of KBID, does it matter to you from a timing perspective whether the return flow is going to the mainstem or a tributary?

A Yes.

Q Why so?

A In general, flows to the tributaries are going to respond to the river sooner than flow that is picked up in the river -- or accrues to the river, excuse me.

Q And does that mean that flows reaching the tributaries will reach users outside of KBID more quickly?

A Yes.

Q Do you have any idea how much more quickly?

A I have not done that calculation directly,

but the analysis considers the location of where the return flows would accrue, whether it's to a tributary or to the river.

Q And of the total available -- strike that.

Of the total that you're referring to, did you try to determine how much reaches the alluvial aquifer?

A No, I did not.

Q Does the answer to that question affect the timing at all as to when the water reaches users outside of KBID?

A No, I don't believe it does.

Q So the water -- the return flows that are going directly to the mainstem and the return flows that are going into tributaries reach areas outside of KBID at the same time as water that goes into the alluvial aquifer; is that correct?

A I would say that recharge to the aquifer is part of the process of streamflow, and additional -- additional streamflow is going to result in additional recharge to the aquifer.

Q So does it affect the timing with which water reaches the users outside of KBID?

A I don't believe so in the situation. I mean, I didn't identify any dry stream reaches.

Q Okay. Let's turn to Section 3 of your report. The first sentence there contains an assumption. Could you explain that assumption to me?

A The assumption speaks for itself. It's that the amount of overuse in Nebraska would have been available to KBID through Harlan County Reservoir.

Q Does that mean that you essentially routed all that water through Harlan County Lake in your analysis?

A I didn't do an explicit routing calculation. The significance of that assumption is that water that was overused in Nebraska would have been available to KBID during the irrigation season in the two years.

Q So if a portion of that water were not routed through Harlan County Lake, how would that affect your report?

A If it was assumed that some of the water came in below Harlan County Lake, then I would have to look at the ability for that water to be diverted at Guide Rock in the off-season, which I suspect could have occurred in these two years.

Q Why would users divert it during the off-season? Is that for, like, preseason irrigation or some other use?

A No. It's not for preseason irrigation.

Q Why would they divert out of the season?

A KBID diverts winter flows at times when the system is water-short in order to get more water into Lovewell Reservoir and get it full.

Q Okay. What was the basis for the assumption that you did use?

A Most of the basin in Nebraska is above Harlan County Reservoir. The test is at Guide Rock, which is the point of diversion for Courtland Canal.

And I think based on what I just told you about the potential to pick up accretions between Harlan County Reservoir and Guide Rock, if the water had not been taken during the irrigation season as a demand or river flow from the reservoir, it likely could have been taken in the off-season.

Q So is that just your professional judgment, based on your experience? Do you have any communications with anyone that told you that was the right assumption or any direction to utilize that assumption?

A It's based on my understanding of the system and the way that the Kansas Bostwick District water supply is related to Harlan County Reservoir and my understanding of the overall use in Nebraska and the

amount of overuse relative to the use.

Q So you were responsible for electing to rely on that assumption?

A Yes.

Q You also note toward the bottom of page 3 that all of the required water would have been delivered in the irrigation season.

On what did you base that assumption?

A That follows from the assumption stated in the first sentence.

Q Okay. So which came first, the chicken or the egg there? Did you assume that all the water would be routed through Harlan County Lake so that it could be delivered in the irrigation season, or did you want it to be delivered in the irrigation season, so you assumed it was routed through Harlan County?

A The primarily assumption is stated in the first sentence. It's that the short -- or, excuse me, the overuse would have been available to Kansas Bostwick from Harlan County Reservoir.

Q You also calculate Courtland Canal losses in this section. Did you speak to anyone about those losses, those actual losses in '05 and '06?

A I don't think directly. There's a long history on this issue going back to the arbitration

hearing. There were definitely discussions conducted between the parties.

Q Talked to Mr. Groff probably?

A Probably.

Q All right.

A And the arbitrator.

Q Okay.

A No -- no direct discussions since that time that I can recall.

Q All right. Do you know what KBID specifically identified as the irrigation season during 2005?

A No, I don't.

Q Do you know whether KBID has ever set an irrigation season from May 1 to September 30?

A I know that May 1 fits within when they take water. I don't recall that they have a specific end-of-year designation that they make. I'm not aware of it if they do.

Q If the -- well, strike that.

Mr. Book, I'm going to hand you the KBID 2005 annual report and just ask you if you've looked at this document before?

MR. WILMOTH: We'll mark this as Exhibit 17.

(Deposition Exhibit 17 was marked.)
MR. WILMOTH: Pete, do you want one?
MR. AMPE: Yes.
MR. DRAPER: What number is this, Tom?
MR. WILMOTH: 17.
A I probably have looked at this before. I don't recall specifically.
Q (BY MR. WILMOTH) I'd like to turn your attention to page KBID 517. Do you see the precipitation numbers in that third column?
A Yes.
Q Could you calculate the irrigation season precipitation for me? Do you need a calculator?
A I have a calculator with me, if I can --
Q That would be fine.
A -- grab that.
(A pause occurred in the proceedings.)
A I'm calculating 19.75 inches.
Q And how does that compare to the 40-year average in column 4?
A I calculate 19.38 for the average. So that calculates very close to the average.
Q And this is May through September, right?
A I'm using May through September, yes.
Q Thank you.

Can you conduct the same analysis for me using only June, July and August, please.

A I'm calculating 17.04 for the year 2005 during the three months, June, July, August, and that compares with 11.29 for the average.

Q So as a percentage of the average, what is the actual precipitation June through August of '05?

A 150 percent.

Q Do you know how much water KBID actually diverted during the irrigation season in 2005?

A Yes.

Q How much water was that?

A Could you repeat the question?

Q Do you know how much water was actually diverted by KBID in 2005?

A Well, your question has some complications to it. Appendix B-2 indicates the total diversions at Guide Rock. In 2005, there was no water delivered to NBID, so I think the answer to your question is the amount of diversion, which is 17,863. That's in Appendix B-2.

Q And what's the source of that information?

A The Bureau records.

Excuse me, I need to modify that answer.

Q All right.

A That tabulation is only for the months of May through September. I don't believe I have the total diversion in my report. That's a seasonal diversion, I'm sorry. I don't know the total diversion for the year.

Q And what Bureau information did you rely on?

A The Bureau of Reclamation records of the Bostwick and Courtland Canal operation. I've got a specific file name listed on footnote 1 of Appendix B-2.

Q Did you create that file or did the Bureau?

A That's a Bureau file.

Q Where is that file housed?

A Well, we typically obtain that information directly from the Bureau of Reclamation.

Q Do you know whether that file's been provided to the State of Nebraska?

A I'm certain that it has.

Q Do you know when the irrigation season actually occurred in 2005 within KBID, the dates of the irrigation season in 2005 as set by KBID?

A There is a note on -- on the report for 2005 from KBID. It's on Bates No. 520 that says the first deliveries of irrigation water and the last day of delivery that -- I don't know if that relates to their

season, but that's certainly an indication of the period in which they were running water. That would be in the lower KBID, not the upper.

Q So that's about a 45-day window?

A I think it's probably 55 or 56 days, something like that.

Q And how much water did you determine KBID would have taken from Harlan County Lake in '05 had Nebraska not overused its allocation?

A I have a number which is April to September for the year 2005 at the stateline, so this is not at the point of diversion on the river, and it's 57,077 acre-feet.

Q So let me take you now to what actually went on in 2005.

If we had, in KBID in 2005, a 55-day irrigation season and 17 inches of rain between June, July and August -- and KBID actually delivered how much water during that period?

A Where are you asking in reference to?

Q How much actual water was delivered.

A The farm delivery for 2005 was 12,601 acre-feet. That's a different number than we were talking about on the last question.

Q Well, utilizing that and the precipitation

and the actual irrigation season, where would you put all of this water? Where would it go?

A On the fields.

Q When?

A During the period May through September.

Q Why did you select May through September?

A Based on historical operations and records.

Q We've plotted out the start and end of the irrigation seasons from the KBID annual reports over the last eight years.

MR. WILMOTH: Mark this as Exhibit 18.

(Deposition Exhibit 18 was marked.)

Q (BY MR. WILMOTH) Assuming for the sake of argument that these dates are correct, how often does KBID set irrigation seasons from May through September?

A I don't know if these are set seasons or if this is simply recording the historical first date and last date deliveries.

Q Well --

A Your note indicates that it's simply the recorded first day and last day.

Q Let's look at 2009. Was that a water-short year?

A I don't know.

Q How about 2010, was that a water-short

year?

A What's your -- what are you referring to when you say water-short year?

Q Well, I'm referring to water-short year under the accounting procedures, the RRCA accounting procedures. There's also a concept of water-restricted year, as I understand it, according to KBID.

Let me ask you, with regard to 2009, was it a water-short year under the RRCA accounting procedures?

A No.

Q Was it a restricted-water year under the KBID rules?

A I don't know.

Q Can you determine that from looking at the KBID annual reports?

A It's possible.

Q Let's assume for the sake of argument that these do represent the irrigation season as KBID defines it, and let's assume for the sake of argument that 2010 is neither a water-short year under the RRCA accounting procedures nor a water-restricted year under the KBID rules.

What's the length of that irrigation season?

A Which year were you asking about again?

Q 2010.
A Three months.
Q So what would happen to your analysis if you were required to assume the delivery of all that water within those three months?
A It's possible it wouldn't affect it.
Q Is it possible that it would affect it?
A I don't know.
Q Do you have any opinion, based on your experience with irrigators and your knowledge of the KBID system, as to whether it would have been reasonable or prudent for KBID to have taken all that water in three months?
A Yes. Based on my observations and review of the historical data, that they typically diverted a full supply, which is 12 to 15 inches; 15 inches is full supply and they often diverted 12 inches.
And whether that occurred specifically between June 1 and August 15 or between May 1 and September 30, it doesn't really matter for purposes of my analysis. It's a seasonal analysis and so the quantities that we projected were within the historical practice.
Q Does it matter that there were 17 inches of rain during that three-month period?

A I don't know.

Q Based on your experience with the District, is it possible that they might have left some of that water in storage for carryover to 2006 --

A That's --

Q -- given that they were having all of this precipitation?

A That's possible.

Q I'd like to turn your attention now to Section 4 of your report. You note that historical operational records from KBID were used to compute system efficiency, but I didn't find a citation there.

Can you tell me which records you're referring to?

A Those are -- well, let me check my source here.

These are Bureau of Reclamation records.

Q I'm sorry, Bureau of Reclamation records?

A Yes.

Q Okay. So they're not KBID records?

A I don't know to what extent KBID provides some of this data to the Bureau. It could be joint KBID collected, reported to the Bureau records. That's possible.

Q Is the source of those records cited in

your report?

A Yes. We used Appendix C to derive the loss factors.

Q What is the source for Appendix C?

A Bureau of Reclamation records.

Q Which records?

A It's a series of tables that the Bureau produces of --

Q Is there some --

A -- deliveries and canal diversions.

Q Is there some way for you to identify those for us?

A Probably by file name. Some of this information had been produced back in the arbitration and it didn't change. Some of that, we didn't include in the data transfer this time.

Q A little further down in the next paragraph, you also note that records are available for four different things, as I infer it: Water delivered above and below Lovewell, discharges from canal and lateral wasteways, farm deliveries, and computed canal losses.

Can you tell me which records you're referring to there?

MR. DRAPER: Which page are you on, Tom?

MR. WILMOTH: 4, extending to 5.

A That's the same set of records that I was referring to. It's the USBR collection of data.

Q (BY MR. WILMOTH) Okay. I'd like to hand you a document that we received from the Department of the Interior and ask you to review it and let me know if you've seen it before.

MR. WILMOTH: We'll mark it as Exhibit 19.

(Deposition Exhibit 19 was marked.)

A I recall seeing tabulations like this. I don't know that I've specifically seen this one because it goes through 2010. It's probably later than anything I would have looked at.

Q (BY MR. WILMOTH) Is this the type of data that you typically would rely on, assuming for the sake of my question that this was produced by the Department of the Interior?

A Yes, subject to an issue that sometimes you run into with differences in records and different tabulations, which does happen from time to time.

The Bureau does maintain a set of tables that we referred to in our report, which contain some of the internal detail of losses and deliveries and canal diversions, which may or may not be consistent with the totals in this table. I would expect them to be close.

Q Do you have an opinion as to the value, the relative value, if you will, of the data that KBID presents to the Bureau and the data the Bureau actually finalizes?

A No.

Q I understand that in selecting the value for the acreage normally irrigated in KBID, that you relied on the period 1994 to 2000; is that correct? I'm on page 5 now.

A Yes, that's correct.

Q How was this value utilized?

A I didn't utilize it, other than to report it here as prospective.

Q Do you know how the value was utilized by the economists, Dr. Hamilton or Dr. Klocke -- Dr. Robison -- or, for that matter, Dr. Klocke?

A Joel Hamilton derived his own value of the acreage to be considered for the years based on his interpretation of the records over some period of -- of time. I didn't do that.

Q I'd like you to look at this period critically for me, from 1994 to 2000, and assume for the sake of my next question that if you were to calculate the average amount of acreage irrigated relative to the available service area, the long-term average is

74 percent.

Do you believe utilization of a value of 89 percent is appropriate and representative of a so-called normal condition?

A I don't specifically have an opinion on that.

Q If I asked you to identify the normal condition, what would you select?

A If I was trying to evaluate the acreage at the end of the period here, I would use numbers at the end of the period, subject to any specific information I had about individual years that would have created anomalous acreages in an individual year or would have created a special circumstance related to whatever affects water use.

Q Is there any value to the long-term average I referenced?

A Not if it's a -- not if it's a district that's trending and if the acreage was increasing over time. For reasons of development or later practice, I would think you would tend to use the later years.

Q Do you have an opinion as to whether KBID reflects any such trends?

A Yes. My understanding was that the acreage had been expanding over the period.

Q Do you know why that is?
A Not specifically, no.
Q Now, if I understand the remaining discussion on page 5 here, you've derived an average application over this period, '05 and '06, of 13-1/2 inches; is that right?
A The 13.5 inches was an average for the years 1994 through 2000.
Q Are you suggesting that in 2005, KBID would have applied 13-1/2 inches of water, irrigation water?
A They could have.
Q Is that an inherent assumption in your report?
A No.
Q What volume of water, in terms of depth, do you assume KBID would have applied?
A The acreage that was used in the calculation of the number of inches shown in Table 3 was provided by Mr. Hamilton. And based on the acreage that he was using for his analysis, he had asked me to quantify the farm deliveries in terms of the number of inches. The number for 2005 is 10.5.
Q Okay. So are you suggesting then that KBID would have applied 10-1/2 inches of irrigation water in 2005? I'm trying to understand the relationship between

the 13-1/2 and the 10-1/2 number.

A The 10-1/2 is less. I'm not suggesting a number because Mr. Hamilton selected the acreage.

Q Okay.

A He could have come up with an acreage that was smaller and had a higher inches or gone the other way.

Q Okay. So you have no opinion on whether that's an appropriate value or not?

A I do have that opinion. The total acreage that he requested I use, the 38,407, is very comparable to the average for the period '94 to 2000, so it seems on its face to be appropriate.

Q So if that's appropriate, then, do you believe, sitting where you do today, that KBID would have applied 10-1/2 inches of irrigation water in 2005?

A Yes.

Q And that's true notwithstanding the fact that they received 150 percent of average precipitation from June through August?

A Yes.

Q Did your analysis consider that actual rainfall or the ET needs of the crop during that year?

A Yes.

Q How so?

A By not exceeding some upper limit. If I had calculated a number from the overuse that would have been either over the 15 inch or if it had been over the average of 13-1/2 inches, at that point, I would have started to indicate to the economists that the amount of water would have been unlikely to be taken. But neither of those conditions happened.

Q So if I understand what you're saying, had you seen a result that indicated KBID would have taken more than 10-1/2 inches, you would have suggested that was inappropriate?

A No.

Q Can you help me understand your prior answer?

A The --

Q Do we need to read it back? We can.

A No. The two numbers I gave you were 13-1/2 and 15.

Q And 15.

A So I never referenced the 10-1/2.

Q I apologize.

So do I understand you to say that had the analysis concluded that more than 15 inches would have been applied, you would have thought that was suspect?

A Yes.

Q And on what basis would you believe that to be suspect?

A A nominal diversion -- or delivery, excuse me, of more than 15 inches would have exceeded probably most years of use by KBID, at least in more recent years -- I'm sorry, not the drought years, but the '94 to 2000 period. And it would have exceeded their -- their base allocation.

So at that point, I would have indicated that the results need to be reviewed.

Q Okay. And do you have any sense of what the net irrigation requirement was for corn, for example, in 2005 within KBID?

A No.

Q Turning to page 6, you note that certain historical data were used to determine the proper allocation of irrigation deliveries above and below Lovewell; is that right?

This is at the top of page 6, first paragraph, midway through.

A Yes.

Q Again, I'd like to ask what data you're referring to there?

A The same data that relates to farm delivery, primarily.

Q This is the USBR data, the Bureau data?
A Yes.
Q Okay. This is the data that was produced during the arbitration?
A Yes.
Q And down in the second paragraph -- I believe we might have covered this, but I just want to be clear -- you state that typically KBID users take water during the months of May through September.
That's based on your review of the historical KBID reports, KBID annual reports, or Bureau data?
A That, and discussions with the District.
Q Mr. Nelson?
A Yes.
Q How about Mr. Ross?
A I don't recall him describing diversion season for me.
Q Do you recall reviewing the KBID annual reports to help gain an understanding of that issue?
A I don't recall that. It's possible that I did.
Q Do you recall whether they contain any reference to the start or end of the irrigation season?
A I don't recall -- well, other than what we

just noticed. Again, you're calling that the season. I'm calling it the first day and last day of delivery.

Q And do you have a reason to believe those are different things?

A I don't have any reason to believe they're the same thing.

Q Okay.

A I'm not even sure what --

Q Sure.

A -- you're referring to with season.

Q So we just don't know?

A I don't.

Q Okay. Setting aside the discussion we've been having, just in your practical experience, do farmers typically furrow irrigate row crops as early as May?

A Well, there's grain crops which are irrigated in May. Corn is typically later. Those are the two row crops I can think of. Soybeans also are row crops. Those would be later.

Q Why do you not typically irrigate corn -- furrow irrigate corn in May?

A Typically, you plant about the first of May, and then you won't start irrigating usually till June, about the first of June.

Q What is being done typically between May and June to prepare the ground for furrow irrigation?

A I'm not sure that anything is specifically done. I suppose furrows are being trenched.

Q Okay.

A Cultivating corn.

Q Then you've got to wait for that corn to reach a certain height before you can do that without covering it all up?

A There you go. The crop is growing.

Q Okay. So is it fair to conclude, then, that the assumption you've made here about taking this irrigation water does not apply to furrow-irrigated corn in KBID?

A I don't think the assumption I made is particularly sensitive to that because I'm not doing a monthly time-step analysis. I'm doing a seasonal analysis.

Q Okay.

A So within the months of May through September, this amount of water is being available to them, but used as historically used out there.

Q Okay. So you're not considering in your analysis this delivery schedule that we talked about earlier necessarily?

A Well, generally I know what the irrigation season is, it's May through September, and so it's generally within that period. But not -- I'm not tracking through specific runs or monthly inches delivered or anything like that.

Q Did you assume a uniform distribution of deliveries over the five months?

A No.

Q How did you -- or did you at all make any distinction with regard to the rate at which that water is delivered?

A We used an historical allocation to the months, where we needed information on the return flow timing issue. That was kind of a small issue, but that part of the analysis required monthly --

Q Okay.

A -- time steps, and we simply took the historic diversion record pattern.

Q So if I understand then, you took the overall volume, and then you looked at that distribution and made a relationship there?

A Yes.

Q Okay. Is that reflected in your report?

A It's in the backup data certainly.

Q Is it possible for you to identify that

data from the file structure you have?

A I would say it's most likely in one of those two return flow files that were -- that I mentioned earlier this morning, Excel spreadsheets, as backup. I know the information is out there. It doesn't appear that it shows up in a table in the report, though.

Q Could you identify that corresponding relationship if we needed you to? I don't mean right now when you're sitting here, but --

A Oh, certainly.

Q All right. Thank you.

I'd like to turn your attention to Section 5 now, beginning on page 6, just some very basic questions here.

You calculated the additional farm deliveries in '05 as 20,900 acre-feet; is that right?

A Yes.

Q And in the arbitration, that number was 22,384 acre-feet.

Can you just generally describe the cause of that reduction?

A The amount of water was reduced for a deduct that was taken for the transit loss or canal loss between the point of diversion at Guide Rock and the

stateline.

That's a -- that's a new analysis in this report that was not in the arbitration analysis, but it's summarized in Appendix B.

Q And can I assume the same answer applies to the difference in the values for 2006?

A Yes.

Q Moving on to Section 6 then, if I understand your view, is that the water deliveries to KBID caused stream gains below Guide Rock in the form of return flows; that's right?

A Additional water delivered to KBID would create return flows in the river.

Q And this is based on the things we've already discussed: your knowledge of the system and the USGS reports and other things?

A Everything we talked about this morning, yes.

Q You further note that return flows result from canal, lateral and field losses.

Did you make any effort to distinguish those or are they treated the same? Do you know what percentage of return flow is attributable to each category, for example?

A We do that because the return flow sources

are itemized in the analysis separate between the canal loss and then the farm loss. I don't recall exactly how the lateral loss is combined or if that's separate as well. I don't recall that detail.

Q Is that analysis set forth in your report?

A Yes.

MR. WILMOTH: While Mr. Book is looking at that, I'd suggest we try to wrap up in about ten minutes and try to get back by no later than 12:45. Is that all right?

MR. DRAPER: Sure.

A The analysis is summarized on Table 4, page 26. The detail for how the return flows are split up between the various canal and farm and lateral losses would be contained in the backup.

Q (BY MR. WILMOTH) And if we asked you to make those linkages, could you do that for us?

A Yes.

Q You also indicated that wasteway flows are measured and reported for the KBID service area, but I don't see any citation for that.

Where are those measurements reported?

A The same Reclamation tables of operations contain wasteway flows.

Q Okay. And you further state that the

return flows were calculated as the sum of the canal and lateral losses, combined with the on-farm return flows, computed from estimated irrigation efficiencies.

Was any of that actually measured or was all of that calculated?

A The wasteway flows are measured.

Q Okay.

A Everything else is calculated.

Q And then as I understand it, you deducted 18 percent for evaporation; is that right?

A Yes.

Q So does that then mean that the -- all of the remaining water reaches the river during the irrigation season?

A No.

Q How much of the remaining water reaches the river during the irrigation season?

A The analysis that we did contains information about seasonal return flows, where we've aggregated returns during the irrigation season and returns after the irrigation season.

Q Where is that?

A I don't believe I have that detail in the report, so it would be in the backup that we provided to you.

Q Okay. And again, if we ask you to make those linkages, you could do that for us?

A Yes.

Q All right. And then you note an analysis was made to determine approximate timing for the groundwater return flows from the District lands.

What was the nature of that analysis?

A That's the Glover analysis that we were discussing this morning before the break.

Q Okay. And where do the system losses in KBID go, physically? Where do they end up? Do they all end up in the river? I'm asking you as a matter of physical reality.

A Yes. We took an 18 percent deduction, similar to what's done in the RRCA accounting, to account for evaporative losses, transmission losses, things like that. The balance goes to the river.

Q But do you know whether any of the lands within KBID contain groundwater wells?

A My understanding is there's minimal, if any, wells.

Q Do you know whether it's possible that any of those wells would intercept return flow otherwise reaching the river?

A I don't believe so.

Q Are you aware of any -- of the existence of any reuse pits within KBID?

A I'm not aware of any.

Q If they existed, would they have any impact on the return flows? Would they intercept the return flows before they reached the river?

A Any on-farm reuse would be reflected in the irrigation efficiency that was assumed. I mean, it's basically a farmwide or irrigation-systemwide efficiency, which would include any effect of reuse. I believe I used 65 percent for -- for gravity.

Q Okay. So that statistic captures any physical reuse through --

A Yes.

Q -- pits or something?

And then a little further through your analysis in this section, you indicate that return flow schedules were developed for drained and undrained lands.

How was that done?

A That's the analysis that we were discussing this morning.

Q All right.

A And shown in the graphs in Appendix D.

Q And separate schedules were developed for

upper and lower KBID.

How were those developed?

A We developed a separate set of parameters and did separate analyses for the land above and below KBID.

Q Are those reflected in your report?

A Yes.

Q Could you tell me where?

A Well, we have factors, which are graphed in Appendix D, which are separate for the area above KBID and the area below KBID.

Q And how did you establish the parameters to which you're referring? Was that all part of the Glover analysis also?

A Yes, it was.

Q And did we discuss that already today?

A Yes, we have.

Q Were there any elements of that we did not discuss?

A No.

Q So just on a very fundamental level, I want to understand the timing of some of this return flow. If I understand your thinking on this, no irrigation water that would have been applied in August, for example, would have been able to reach the river as

return flow usable by downstream diverters; is that correct?

A No, that's not correct.

Q Okay. I was under the impression that you had a 60-day timeframe for return flows to reach the river; is that not right?

A That's not right.

Q Can you tell me how long it takes return flows applied at KBID to reach the river?

A There are three types of return flows. There are wasteway discharges, which are the measured. That's effectively tailwater or like runoff. It ends up in the stream. That has immediate availability.

Q Okay.

A There is the return flows that were assumed to be intercepted by the drains, and those use the response functions developed from the Chapter 8 drainage says. Approximately -- more than 80 percent of the return flow is available during the month of application.

Q Is that by virtue of the drains?

A Yes.

Q And there was a third category; is that right?

A The third category is return flow that's

not intercepted by drains, which is longer delays to the stream -- tributaries and to the river. Those return flows will be delayed, but some aspect of those would probably occur, if not immediately, fairly shortly.

Q Did you break down your total volume of return flow by each of those categories?

A Yes.

Q And is that reflected directly in the report?

A It's reflected in the backup material --

Q Okay.

A -- we generated.

Q And if we asked you, you could associate those linkages for us?

A Yes.

Q All right. Now, you ultimately conclude that the total return flows from KBID in 2005 would have been 15,000 acre-feet; is that right?

A Yes -- could you restate that question?

Q Sure.

I understand that you calculated the total return flows from KBID in '05 as 15,000 acre-feet?

A That's correct. That shows up in Table 4.

Q And in the arbitration, you concluded it was 20,200 acre-feet. What was the basis for that

change?

A There's a couple of reasons. One is that there was less water coming into the system because of the deduction for the Courtland Canal loss that I mentioned.

And then the second thing would be the timing component that was incorporated in this analysis. We were using assumptions of fairly quick response in the original analysis as it related to annual numbers.

Q And if I understand -- excuse me, strike that.

May I assume that your answer is the same as to the difference for 2006?

A Yes.

Q And if I understand the report, you conclude that 20,900 acre-feet would have been delivered to the fields in '05, and 15,000 acre-feet would have manifested itself as return flow; is that right?

A Yes. 15,000 is not limited to -- or is not derived solely from the 20,000, though. Your question implied a low efficiency.

Q Okay.

A But it has canal loss included in that.

Q Okay. Ultimately what I'm getting at is, how much of the 15,000 would have manifested as return

flow during the irrigation season?

A If you look at Appendix D-10 --

Q Uh-huh.

A -- there is a distribution shown. This is on page 46.

Q Thank you. Is that the 14,775 figure?

A Yes.

Q So 99 percent of the return flows would have reached the river during irrigation season?

A Yes.

Q And that would have occurred at rates up to 49 cfs; is that right?

A Yes.

Q How did you calculate that?

A How did I calculate what?

Q How did you calculate that rate of delivery?

A I believe that's the average rate over the season, May through September. It's either -- yeah, it it's May through September. It's noted there. By taking the number of acre-feet, just averaging that over that over that set of months.

Q So the rate doesn't exceed 49 cfs?

A The rate does exceed 49 cfs. That's the average.

Q Okay. That's the average. So what was the average in July, do you know?

A It looks like about 100 cfs.

Q So if I understand, you're assuming a return flow of 100 cfs in July, right?

A That's the result of the calculations, yes.

Q And in 2005, in fact, I think we established that in July there was about 6.2 inches of rain; is that right? Can you look back at the annual report for me?

A Yes, that's correct.

Q So if there was enough water to be applied to the lands to create 100 cfs of return flow, and 6.2 inches of rain were received in July, would you expect any flooding to occur in KBID?

A No.

Q Why not?

A I'm not familiar with the drainage problems and any low spots in the district. I assume these are quantities of water that are dealt with normally within the district.

Q So when you say no, do you mean you don't expect there to be flooding or you don't have reason to believe there would be flooding?

A I don't have reason to believe there would

be flooding.

Q Do you have reason to believe there would not be flooding?

A I don't have any reason.

MR. WILMOTH: Let's break for lunch.

(Recess taken from 11:41 a.m. until 12:50 p.m.)

(Mr. Larson is not present in the deposition room and Messrs. Perkins and Beightel are not present via telephone.)

Q (BY MR. WILMOTH) Welcome back, Mr. Book.

A Thank you.

Q Before we proceed any further with any of these reports, can you tell me what work your colleague, Ms. Schenk, performed on these?

A She assisted in the analyses of the quantifications that are done, the spreadsheet analyses in terms of inputting data, processing the spreadsheets. She helped in preparing a table and figures in the reports.

Q Is there any portion in any of the three reports that Ms. Schenk was the primary author on?

A No.

Q Are there any analyses in particular that I should be directing questions to her concerning?

A No.

Q Mr. Book, are you aware of any saturated or unsaturated zones below the land in KBID?

A The references that I cited, which is references 14 and 15, contain information that describes the KBID lands. And there is water-level data provided in that report that describes water-level information in KBID lands.

Q Are there any unsaturated lands within KBID?

A I don't believe so.

Q So the entire area of KBID is fully saturated to the surface? Is that why they drain it?

A Not to the surface. The water levels came up significantly after the implementation of the project, and the water level data and cross-sections in those reports indicate that the water level is high, basically throughout the entire district area.

Q If there were any unsaturated zones, would it affect your analysis in any way?

A It could, yes.

Q How would it manifest itself?

A If the water table were lower and not subject to drainage, that could affect whether water is drained or not.

Q In terms of manifesting as return flow, for example?

A Well, all the water is eventually going to manifest itself as return flow. It would just become a question of timing.

Q Okay. On page 8 of your report, Book I, you indicated that if more water had been available to non-KBID farmers, they would have used it.

On what did you base that assumption?

A Primarily on the review of diversion information that is tabulated in this report.

Q And in reviewing that information, which -- which statistics or figures did you ultimately rely on?

A I guess really both the quantities diverted over time, as well as the acreages served over time. The acreages served can be combined with the amounts of diversion to give an indication of depth of water that these water rights have experienced historically over the period back in 1994.

Q And did you rely on an average figure to calculate what would have been used?

A Yes.

Q Am I correct in understanding it's the average of the period, '94 to 2004?

A Yes.

Q Did you conduct any analyses to determine how precipitation in '05 and '06 related to that period and the average usage you calculated?

A No, I did not.

Q And ultimately you conclude that 2500 acre-feet would have been available; is that right?

AUTOMATED VOICE OVER SPEAKERPHONE: Sam has joined the conference.

A Table 4 contains an entry, additional flow available below Spring Creek, which is 2500 acre-feet. I don't know if that's responsive to your question or not.

Q (BY MR. WILMOTH) Well, let me refer you to page 9, the last sentence of the first paragraph. Is that 2500 acre-foot figure referenced in that sentence the value that you have concluded would be available as return flow -- and diverted, excuse me?

A Yes.

Q Okay. And in the arbitration, you concluded it was 9100 acre-feet. Is the difference principally due to the use of the averages?

A Yes.

Q You also noted that some senior users on the mainstem between the stateline and the confluence with Spring Creek would have used additional water.

Where would that water have come from?

A The canal loss in the reach of canal between Guide Rock and the stateline.

Q And when did you anticipate that water would have reached the stream outside of KBID? Is that on the same schedule as the other calculations you made?

A Within the season, so it's a very closed canal. It parallels the river for that entire reach.

Q Is that conclusion directly set forth in your report or is that a separate calculation?

A I don't recall there is a separate calculation for that. It's just assumed.

Q Okay. And then you kind of conclude this discussion, Section 6, by suggesting that there would be remaining undiverted water that would have been substantial.

What do mean by that?

A Just looking at the amounts. They're substantial as a percentage of the amount of overall Nebraska overuse.

Q And what happens to that water when it bypasses KBID and the users downstream?

A It flows on downstream in the Republican River.

Q And does it ultimately end up in Milford

Reservoir?

A Yes, depending on storage conditions at Milford.

Q In your experience, has KBID ever called for water from Harlan County Lake for any reason other than satisfying its own irrigation needs?

A No.

Q And then in the summary, you ultimately conclude the total additional supply would have been 42,844 acre-feet.

Do you see that?

A Yes.

Q Am I understanding that correctly --

A Yes.

Q -- the total over the two years?

A That is correct.

Q Okay. And in the arbitration, it was 50,500 acre-feet. Can you just summarize the principal bases of the changes?

A The subtraction of canal loss between Guide Rock and the stateline from the amount of overuse delivered to Kansas is the first one.

The second one would be the amounts of diversion on the downstream senior water rights.

Q And I'd like to turn your attention to

Table 1. We have had a hard time replicating a couple of the numbers in here, and I want to walk you through how they were calculated.

I'd like to hand you a document that we received from the KBID district. We'll mark this as Exhibit 20.

(Deposition Exhibit 20 was marked.)

Q (BY MR. WILMOTH) And first of all, with respect to this figure -- excuse me, this document, KBID 2010, do you see that -- excuse me, KBID 210?

A Yes.

Q Am I correct in understanding in column 3 that the Courtland Canal, 15.1 river mile, if you will, is the stateline?

A Yes, I believe that's correct.

Q Would you be so kind as to calculate for me the sum of the figures listed there for April through September?

A I have that.

Q Can you tell me how that -- well, let me ask you, what did you derive as the sum?

A 21,315.

Q Can you tell me how that figure relates to the 19,301 figure in your Table 1 under the historical seasonal diversion?

A The total in this table you handed me is 21,315, and the total for the USBR record -- excuse me, the total for the USGS gage data, which is what I'm using for this number from our table in Appendix C is 19,300, so there is a difference of about 2,000 acre-feet.

Q Can you tell me why you would rely on the USGS gage data over the actual KBID data to calculate that number?

A I recall there was some disagreement between the Bureau data and the USGS data at that location. I don't recall the details about which was considered more accurate by either agency. We had simply adopted the USGS --

AUTOMATED VOICE OVER SPEAKERPHONE: Chris Beightel has joined the conference.

A We had simply adopted the USGS figures for this location as the basis in our prior work and didn't go back and revisit that.

Q (BY MR. WILMOTH) All right. Can I turn your attention to KBID 211 on the out -- on the handout that I provided you. And I'd like to ask you to --

A I've only got 210 on here.

Q I apologize. I gave you an incomplete copy there.

In the row that is marked Loss Stateline to Lovewell, do you see that, row 4?

A Yes, I do.

Q Could you calculate on your computer there the April through September figures and tell me what you come up with?

A That number is 4,689.

Q And can you tell me how that figure relates to the 2,675 figure you have as the Courtland Canal loss above Lovewell Reservoir?

A The figure in the -- in my table is 2,675 that corresponds to that.

Q Do you know why there would be such a discrepancy?

A I don't know at this point in time.

Q Can you tell me what the source of your information was for the 2,675 figure?

A That should be a combination of the USBR records of deliveries for inflow to Lovewell Reservoir, as well as farm delivery, and using the USGS gage data for the Courtland Canal at the stateline in Appendix C-1.

Q Is this a similar case of just choosing to work with the USGS data?

A It may be. I'm not sure.

Q All right. Let's turn to your second report, the Book II report, if you will.

Now, in this report, I understand you're trying to determine certain actions that would have been necessary for Nebraska to reduce beneficial consumptive use to its Compact allocation in their relevant years of '05 and '06; is that right?

A Are you referring to the --

Q This one here (indicating).

A Yes, that's correct.

Q Who instructed you to perform this task?

A The State of Kansas requested this analysis to support the analysis being done by the economists.

Q So was that Mr. Barfield?

A No.

Q Was that counsel?

A It was counsel.

Q Okay. Now, as I understand it, you set out to identify reductions in surface water, CBCU and groundwater CBCU that would have brought Nebraska into compliance; is that right?

A Yes.

Q Did you begin with the calculation of overuse that you used in Book I to identify the necessary reduction target, or did you rely on something

else?

A The figures we used are shown in Table 1. I believe that corresponds to the same figures in the prior report.

Q And just for clarity in the record, that was calculated pursuant to the work elaborated on in Book I?

A Yes.

Q Thank you.

And what did you assume was Nebraska's Compact allocation in those years?

A I started out with the same allocation as contained in the accounting for those two years.

Q Okay. And why did you believe that to be necessary?

A The analysis required that we quantify the change in CBCU that would be necessary to attain a two-year balance --

Q So you --

A -- above Guide Rock.

Q Okay. So you're starting with an allocation under the Compact and trying to figure out how to stay below that; is that --

A Yes.

Q -- a fair summary?

If you didn't have that beginning allocation, would you have been able to complete this report and achieve your objective?

A I think the analysis depends on having an allocation, as well as a CBCU, so it's the combination of the CBCU and allocation that allows you to make the calculation.

Q Okay. And as I understand it, you calculate the total Nebraska overuse at the 79,000 acre-feet figure, and we took that from Book I, correct?

A Yes.

Q How would your analysis in this Book II report change in the event Kansas were assigned all the 2006 evaporation charge from Harlan County Lake?

A The amount of overuse for Nebraska would be reduced and the amount of reduction in CBCU between surface and groundwater would then be reduced.

Q Do you have an opinion as to whether that would essentially be a linear relationship? If you assume 79,000 acre-feet and you revise that downward by, say, 16,000 acre-feet, would the corresponding reduction in CBCU and surface water -- excuse me, in groundwater CBCU and surface water CBCU be a linear function of that reduction from 79- to 63-?

A I don't think it would be exactly linear

because of the change in allocation that occurred with the assumption that reservoir water would be supplied and that changes the allocation.

Q Do you have any sense as to the practical effect of the reduction of 16,000 acre-feet from your starting figure on the conclusions in the report?

A I have not really considered that, think through all the implications of that.

Q And if the starting figure that you used, the 79,000, were actually reduced in, say, half, if the Court were to conclude that Nebraska's violation is really based on an average of those two years, would that affect the report?

A That would affect it. I don't know how it would affect it.

Q In your summary table on page 3 of this report, I see that you increased the imported water supply credit?

A Yes.

Q Can you tell me why that occurred?

A That's the result of running the groundwater model at a different level of pumping, and that's the results that you obtain with the accounting procedures when you take the modified groundwater model run. It changes the imported water supply credit for

these two years by that amount.

Q In conducting those runs, did you employ any modifications to the model, other than the procedures that you've talked about in the report, in terms of what Nebraska would need to do to curtail its uses?

A No.

Q On page 3, if I understand it, you assume that most of the surface water diverted by the major project canals would have been eliminated. Is that right?

A That's correct, yes.

Q On what do you base that assumption?

A That was a selection or an election that was made for this analysis to distribute the reduction in CBCU between groundwater CBCU and surface water. It was decided to basically take the -- most of the surface water first.

Q Why did you make that election?

A The efficiency of using surface water for reduction in CBCU is higher if you compare it to the amount of acreage that has to be reduced because of the indirect effect of reducing pumping on groundwater CBCU.

Q Were you present for Mr. Larson's testimony yesterday?

A Yes.
Q Did you hear he and I discuss the concept of optimization?
A Yes.
Q Is that concept the kind of thing you're talking about if you're trying to maximize streamflow?
A It would depend on what your objective function is for the optimization. In this case, the consideration I was looking at was how much acreage would be affected if you were comparing reducing surface use versus comparing groundwater use.
Q Was there anything you were trying to optimize?
A No.
Q Okay. You next assumed that the majority, I guess, of the remaining overuse would have been remedied through reductions in the so-called 10-2 rapid response region; is that right?
A Yes.
Q Was that region identified in the Integrated Management Plans in place in '05 and '06?
A No, it was not.
Q Why did you elect to use those parameters?
A It provided a strip or a zone of area along the alluvium -- alluviums in the basin that were

determined by Nebraska to be the most efficient, I guess is a way to consider it -- to characterize it, for the ratio of groundwater pumping to depletion reduction.

And so it was decided that that was the basis for our analysis was to identify strip of -- or zone of pumping that needed to be reduced. When we used this area, it produced the necessary amount of pumping reduction.

Q And that 10-2 region is identified in the present IMP; is that right?

A Yes.

Q Are there any other provisions in the present IMPs that relate to the issues before you in this report?

A I don't believe so.

Q The provisions of the IMPs relating to surface water curtailment, for example, are not relevant?

A Well, the analysis here reduces surface water in CBCU. As part of the overall reduction in CBCU, the Management Plans don't really provide specifics as to how much surface water CBCU may be reduced.

Q So you didn't look at other options, such as augmentation or surface water purchases or anything

like that?

A I did not look at augmentation. The issue of mechanically how surface water would have been removed from use, we didn't really get into that issue, as to whether it was done by lease or purchase or some other agreement.

Q Why did you treat the federal and non-federal surface water users differently?

A The -- I made the decision not to change the amount of CBCU associated with the surface water pumping. These are small structures and the thought was that activities that were similar to what happened in '06 and '07 would have been feasible to assume as it related to the federal canals. I decided not to remove the Haigler diversion, in part, because of the location of the Haigler Canal.

Q And why is that location relevant?

A It's located so far upstream in the system and because of some of the interstate issues surrounding that canal, it may be complicated.

Q So just to be clear, with regard to this particular report, the Book II report, this is not directly an effort to emulate the effect of the present IMPs, is it?

A That's correct, it is not.

Q On page 5 of your report, you have a section entitled Class 5 and 6 Land Capability. Do you see that?

A Yes.

Q What does "land capability" mean?

A I don't know specifically what the term "capability" refers to. This is the data that's available from the USDA soil survey database. And so it's how they classify the land, and the capability relates to the Classes 1 to 4 and 5 and 6.

Q Do you know what criteria the agency employs to classify those soils into their capability classifications?

A No, I don't.

Q How did you use these classifications in your report?

A We were asked to identify the Class 5 and 6 lands that would be included in the groundwater acreage that was being removed from irrigation in the analysis.

Q Who asked you to do that?

A Joel Hamilton.

Q Do you know why he asked?

A Yes. He is treating the dryland crop capability differently if it was Class 1 to 4 or if it was Class 5 and 6.

Q Do you know whether the Classes 5 and 6 have a good yield potential?

A I don't.

Q Are there any areas in Kansas that have a Class 5 or 6 classification?

A I don't know.

Q All right.

MR. WILMOTH: I think I'm ready to move into the final report. Why don't we take about five, ten minutes, and I'll organize a couple things and come back.

(Recess taken from 1:27 p.m. until 1:40 p.m.)

Q (BY MR. WILMOTH) Now, Mr. Book, before we turn to your third report, I just have a couple of cleanup questions on the other reports. Specifically with regard to return flow, a couple of quick questions.

Do you know if there was any return flow in Kansas resulting from Nebraska's overuse?

A The Compact accounting is a combination of CBCU and stateline flow, and so my view of the accounting would be that any return flows that reached the stateline were included in the Hardy gage or -- yeah, basically the Hardy gage and would not have counted against CBCU that was considered to be overuse

here.

Q Physically speaking, though, there might have been water manifesting as return flow, whether it was accounted that way or not?

A Yes, that's correct.

Q Do you have any idea what the volume would be?

A No.

Q And earlier we talked about return flow originating below Guide Rock. Do you recall that?

A Yes.

Q Do you know if there are any Nebraska water rights below Guide Rock?

A I believe there are. I wouldn't be surprised if there are. I didn't particularly investigate that.

Q Did you consider the extent to which those users might have used any of that water?

A No, I didn't.

Q All right. Let's turn to what we call Book III. Now, in this report, as I understand it, you are trying to identify the level of groundwater CBCU reduction for Nebraska's long-term compliance; is that accurate?

A Yes.

Q And who directed you to perform this work?
A Counsel for the State of Kansas.
Q And you explain here on page 1 that your analysis computes the level of groundwater CBCU that could occur within the allocation to achieve compliance with the five-year test; is that right?
A Yes.
Q How did you determine what Nebraska's allocations would be in the future?
A I used the period '02 to '06 as the level of water supply and allocation that we're going to use for this analysis.
Q Does that mean that your analysis is designed to ensure that Nebraska remains within the allocations during that period?
A To -- the analysis requires that the CBCU be limited to the five-year allocation -- to the total of the five-year allocation over a five-year period with this allocation, basically.
Q The '02 to '06 Compact allocations?
A Yes.
Q And you derived those using the accounting procedures?
A Yes.
Q The RRCA accounting procedures --

A Yes.

Q -- correct?

Okay. Why did you focus solely on groundwater?

A The focus is on the reductions in pumping to reduce the groundwater CBCU, assuming that the surface water uses would be maintained to the extent possible at levels that were comparable to current conditions.

So it's basically assigning a preference to reducing groundwater CBCU over surface water CBCU.

Q And how does that preference relate to the analysis you conducted in Book II, which assumed that the efficiency of curtailing surface water was greater than that of reducing groundwater?

A Since the purpose of this analysis is to look to longer-term requirements for Compact compliance, it seemed more appropriate to me to consider the limitations to occur on the groundwater CBCU as opposed to some sort of a permanent or quasi-permanent reduction or commitment of surface water reductions to the compliance.

That's different than the question I was asked to resolve for the '05, '06: How could the compliance have been achieved for those two specific

years by reducing Nebraska use in a way that sort of minimized the impacts.

Q So it was your decision to prioritize the groundwater reduction?

A No, not my decision entirely. This was a joint decision. I think it originated way back in '08 when discussions were started between the states through the Compact administration and the -- the analysis has basically been carried through the arbitration into this proceeding with the same basic assumption.

Q Okay. Are there any major differences between the analysis you prepared in the arbitration and the analysis contained in this report?

A There's two that I can think of. One relates to the area of pumping reduction. In the arbitration report, the reductions in pumping were applied to a zone that included areas outside of the alluvial zone along the river for water rights, I believe, that were post 2000.

That was not done in this one. The zone was redelineated, I believe, or the corridor that we're using. So that -- that aspect is one.

The second one is a slight modification to the calculation of the amount of water that would be used by surface water when pumping is reduced and

creates more flow in the stream relative to historic. I would consider that to be a refinement and not a modification.

I know that there are other modifications that were made to the baseline condition in the pumping run, but that was covered by Steve Larson in his report.

Q Okay. Ultimately, I think you conclude that there is a reduction of 181,000 acre-feet from groundwater CBCU -- strike that, excuse me.

My understanding is that you believe that groundwater CBCU should be reduced to 181,000 acre-feet; is that right?

A That's correct.

Q And you conclude that that will require a retirement of 302,000 acres of irrigated ground; is that right?

A Yes, that's correct.

Q Do you remember how many acres of irrigated ground you-all originally thought would be retired in the arbitration?

A No, I don't.

Q Was it over a half a million?

A It was.

Q Can you explain to me how the groundwater CBCU reduction should be to 181,000 acre-feet and that

reduction originally impacted 500-some-thousand acres but now only impacts 302-?

A I don't know the specifics of the reasons, but generally, it would relate to the conditions used in the baseline pumping analysis and projections going forward as one reason.

Another reason would be the elimination of the post-2000 wells outside of the alluvial area.

Q Do I understand you to say that that was really work done by Mr. Larson?

A Yes.

Q Thank you.

Is it possible that Nebraska could comply with the Compact in any given year without imposing additional limits on groundwater use?

A In any particular year, they could, yes.

Q We spoke about this briefly, but could you elaborate for me on your assumption that Nebraska would curtail 302,000 acres of groundwater irrigated acreage but allow all surface water uses to continue in the future? Was that the result of the preference that you earlier spoke of?

A Yes. The -- this analysis was focused on limiting groundwater pumping. One of the reasons for that would be that groundwater pumping effects are

lagged into the future, a significant -- to a significant degree, and once pumping occurs, it's not possible to remove that depletion from the system.

It's out there. Surface water is much more amenable to realtime impacts turning on or turning off. But the purpose here was to develop a sustainable level of pumping that would maintain compliance with a large amount of groundwater use continuing into the future and allow the surface water users to continue to -- the surface water uses to continue at, not current levels because there's going to be reductions in the future as pumping depletions go up, but at levels comparable to today.

Q And we've talked a little bit about the fact that in the Book II report you assume surface water would be regulated.

Again, so help me understand, is that because you were not concerned in the Book III report about efficiencies or optimization of streamflow through shutting down surface water uses?

A In the first report, it was not an assumption that surface water would be regulated. It was an assumption that surface water would be probably acquired and committed to that specific reduction.

For the purposes of this analysis, it was

assumed that surface water would not be either regulated or purchased.

Q Do you think that that assumption is consistent with the current content of the IMPs in place today?

A Yes, I do.

Q Why is that?

A It's my view that the current plans do not provide enough specifics themselves that require surface water reductions, either through administrative or through purchase activities.

Q You indicate in your report that Nebraska's groundwater CBCU has been increasing and is projected to increase in the future; is that right?

A Yes.

Q What projections are you referring to there?

A Would you refer me to a specific --

Q Sure.

A -- sentence?

Q This would be the first sentence of the third paragraph in the introduction.

A Yes. That's based on the model projection runs that were developed by Steve Larson.

Q Do you know whether groundwater pumping in

Nebraska has increased or decreased since 2002?

A I believe the actual pumping amounts are less since '02 than they were for the '98 to '02 period.

Q Later down in that same paragraph, you indicate that given the overuse of allocation that occurred, pumping reductions going forward are necessary to balance CBCU and allocations over a dry period similar to the recent period of lower allocation.

Do you see that?

A Yes.

Q To what overuse are you referring there?

A The '03 through '06 overuse, and I believe '02 also falls in the category.

Q So this is different from the '05, '06 overuse that you were addressing in Book II?

A Yes.

Q And why is it necessary for groundwater CBCU reductions to balance that overuse?

A Because the compliance was not achieved over this period, this five-year period, which has already occurred. Since this time, pumping depletions are probably somewhat higher than they were over this period, and sort of average-level groundwater depletions since they continue to increase, and virtually all of the surface water had been allocated over the two years,

'06 and 07, and there were still shortages. So that's the basis for my conclusion.

Q So are you suggesting that Nebraska needs to demonstrate in this case that it would have avoided the prior violations? Is that what you're trying to achieve?

A That's one way to look at it. We're making a projection going forward, but using the '02 to '06 period of water supply and allocation as a baseline.

Q And what do your projections show with regard to Nebraska's ability to achieve that?

A I'm sorry, I don't understand the question.

Q Under the present framework, have you conducted analyses of Nebraska's ability to do what you're suggesting should be done?

A Yes, somewhat.

Q Can you tell me whether those analyses show a Compact violation in the future?

A Well, yes, they would. When you project pumping depletions into the future unrestrained in the way that we have restrained them, but based on projections that fit within the current plan limits on pumping, and then you go through a period similar to the '02 to '06 allocations and you have surface water use occurring, then overuse occurs under that condition.

Q When does that occur?
A That occurs when you have a water supply comparable to the '02 to '06 period.
Q What -- what year does that occur in, in your projections?
A The model projections are based on 1995 through 2009, so the corresponding years for '02 to '06 fit within that.
We looked at the third cycle, so I know definitely in the third cycle that compliance is not achieved under that condition.
Q Do you know what year that would be?
A Yes, I do.
Q Could you tell me?
A I don't believe I've got the information published right here in the report. It's a recurring cycle, so if you would look at the years '02 to '06 corresponding to the third cycle, it would be out in the 30 to 45 year range.
Q Okay. If total CBCU under the accounting is a combination of groundwater CBCU and surface water CBCU, why couldn't Nebraska reduce surface water supplies -- excuse me, surface water consumption in an effort to comply with the Compact?
A I'm not sure I know all the reasons why

they may not be able to do that. I know that United States Reclamation project -- projects are involved. I know that senior water rights are involved.

Those are two reasons I could think of which would either prevent or hinder that type of management.

Q If Nebraska were to successfully reduce its surface water CBCU in any given year, how would that affect your analysis?

A The amount of reduction in groundwater CBCU would be reduced.

Q And I assume the corresponding acreage value of 302,000 would be reduced?

A If it were assumed that surface water in some like amount were available and applied. I think one concern about that assumption would be that the availability of surface water going forward is going to be less.

Q Have you quantified that in any analysis?

A No.

Q Can you tell me why you focused on the 2002 to 2006 period to determine the level of future groundwater CBCU that would be acceptable?

A Yes. That's basically a critical period type analysis, a period of low allocations that is being

used as the test to see whether compliance would be certain under conditions that have already happened.

Q And is it possible that under similar conditions, allocations could be larger in the future, through augmentation, for example?

A That's possible.

Q And how would that affect your analysis if allocations were larger?

A Well, to the extent that allocations were increased due to augmentation water, that would have the effect of lowering the amount of reduction in groundwater CBCU over this period.

Q And do I understand you employed the RRCA Groundwater Model to evaluate the reduction necessary?

A Yes.

Q What assumptions did you place into the model with regard to future precipitation, or is this something that Mr. Larson performed?

A This is Steve Larson's area --

Q All right.

A -- and we didn't -- I was not involved in that.

Q Getting back to your preference for curtailing groundwater first, is that preference reflected in any provisions of Nebraska state law that

you're familiar with?

MR. DRAPER: Are you asking him a legal question on Nebraska law?

MR. WILMOTH: I'm asking him if he's identified any law or regulation in Nebraska that is consistent with the preference he's expressed, in his view.

MR. DRAPER: Sounds like a legal question to me.

MR. WILMOTH: Okay.

MR. DRAPER: But if he has an opinion, he can testify.

MR. WILMOTH: In fairness --

Q (BY MR. WILMOTH) For clarity sake, if you haven't given that any consideration, that's a perfectly valid answer.

A In response to your question, the consideration would just be general prior appropriation in which we're dealing with senior surface water rights.

Q Mr. Book, I'm going to hand you testimony offered by the Bureau of Reclamation's area office manager, Mr. Aaron Thompson, on the Upper Republican IMP.

Have you ever seen this document?

A I believe I have.

Q I'd like to turn your attention to page 6, the last sentence of that first paragraph. Could you read that sentence?

A "We again want to stress that the earliest water rights in the basin are the surface water rights that are currently not" -- "that are currently not be provided 'equity among water users' and will not be in the future if this IMP is adopted."

Q Is this preference that you're expressing in the Book III report reflective of this type of testimony? Is that -- are you trying to achieve the kind of equity that Mr. Thompson's referring to?

A I'm not quite sure what he's referring to there with the quotation "equity among water users."

Q Well, why don't you read the whole paragraph and maybe --

A Sure.

Q -- that will help illuminate it.

MR. WILMOTH: This will be Exhibit 21.

(Deposition Exhibit 21 was marked.)

A Yes. What's your question?

Q (BY MR. WILMOTH) The preference that we talked about, which is manifest in the Book III report, is that preference designed to reflect the kind of equity that Mr. Thompson is talking about by protecting

senior water rights as -- as I thought I understood you to say?

A He may be implying some more sharing with this reference to allocating consumptive use in an equitable manner. It's not clear what that means, but his reference to marketing indicates potential sale of surface water to help address the issue.

That's not quite what my view is. Mine was based more on the seniority of the water rights, and that may or may not relate to whether some other equitable allocation is made.

Q Have you ever discussed that matter with Mr. Thompson or anybody at the Bureau?

A No.

Q In Section 2 of your report, you explain in this section that you determined the approximate level of CBCU that would provide a balance with the allocation, which I assume is the 2002 to 2006 period; is that right?

A That's correct.

Q And if I understand it, that the model was employed, but you didn't work with the model directly. You relied on Mr. Larson's work; is that right?

A That's correct.

Q You throughout this process established a

pumping reduction corridor along the streams; is that right?

A Yes.

Q If I understand the discussion with Mr. Larson and the information in the report, this was to determine a more efficient benefit to streamflow occurring from a narrower area than if reductions were spread throughout the basin; is that right?

A That's right.

Q Can you explain to me that concept of efficiency one more time that you're referring to here?

A The wells along the stream are -- have more early effect on streamflow. The wells further away from the stream have a more lagged effect, and also the wells closer to the stream appear to have more of an actual effect in total. See if you get more efficiency in terms of acreage by focusing on the wells along the stream.

Q And we agree that curtailing surface water uses would be even more efficient, don't we?

A In terms of the definition of efficiency that relates acreage to CBCU, that's correct.

Q Did you participate in selecting the period 1995 to 2009 to be representative of the future condition?

A No.

Q Was that something Mr. Larson did on his own?

A I don't know if he did it on his own, but it was Mr. Larson's determination, as I understand it.

Q Do you have any opinion about how likely that future scenario is to transpire?

A Yes. My understanding from Mr. Larson is that the precipitation average over that period, which is partly what's driving the relationship of pumping and depletions, is representative of the much longer term record of precipitation that we have.

Q So your understanding of that issue is based on discussions with Mr. Larson?

A Yes.

Q And you spoke to me earlier about potential noncompliance in the third cycle of that future scenario?

A Yes.

Q Do I understand that that concept is reflected in bullet point 3 on page 3 of your report?

A Yes, it is.

Q Can I ask you what happens in -- if you just look at the first cycle?

A With this level of reduction in pumping or

if you just use the first cycle, then the amount of reduced CBCU and acreage will be less.

Q And if you just looked at the first cycle, but you didn't include this proposed pumping reduction, what do you see? Do you see a violation of the Compact?

A Yes, you would.

Q In the first cycle?

A Yes.

Q And what years would those -- would that occur in?

A The '02 to '06 years, within the first cycle.

Q So if my math serves me correctly, which it rarely does, that would be 2024?

A Something around there, yes.

Q Okay.

A I can't . . .

Q I'm a lawyer. I don't carry around a calculator. Okay.

On this page 3, you identify a series of criteria and assumptions. We've spoken of many of these. Can we just run through them, and I'd like you to tell me generally why the assumption was made. If we've already addressed it, feel free to indicate that.

A The first assumption, I think we've already

discussed. The second assumption relates to the preference for groundwater irrigation pumping reductions that we've already discussed.

The third assumption relates to the period of projection, how far out we're looking for compliance. To that point, I would add that the purpose of this was to develop a sustainable level of pumping, so that sustainable is referring to some period of time going forward that a level of pumping could be maintained.

Q Is that the 45-year period -- or the 60-year period, excuse me?

A The 30 to 45 years.

Q Okay. So I just want to be clear about that assumption. The idea is if a pumping reduction is in place today, it will ensure that there is no threat of noncompliance in that cycle; is that the idea?

A That's correct, with respect to the five year. I think I point out elsewhere in the report that we didn't -- we didn't lock this down all the way to the two-year test, and surface water reductions would be necessary in the two-year water-short test.

Q Okay. Sorry to interrupt. Continue, please.

A The fourth assumption is more analytical. It's a recognition that if streamflows are increased

compared to the '02 to '06 period, then some use in the surface water over that period would increase, assuming that surface water use is continued.

The next point is simply stating that the water supply credit, imported water supply credit calculation is recomputed with the groundwater model for the projection run pursuant to the accounting procedures.

The next assumption, as I just mentioned, is that using a five-year total would not ensure compliance within a two-year water-short period within there.

The final assumption is recognition that this reduction in pumping would not have immediate impacts to the stream.

Q Let me ask you about the fourth point there. I thought earlier we discussed the projected future use of surface water, and you indicated that surface water supplies would be decreasing and, therefore, surface water use would decrease.

Did I misunderstand that or is that consistent with this statement?

A Yes. I think my point was, at continued pumping levels, continuing depletions -- increasing depletions, surface water use would go down.

Under this pumping scenario, if this one were adopted, we would actually have lower groundwater CBCU over this dry period, which would have the effect of allowing a little more surface water use.

Q I see. So if there were an increase in surface water use, would there be a corresponding increase in surface water CBCU?

A Yes.

Q Okay. And the basis for your assumption that Nebraska would allow that is your preference for the Prior Appropriation Doctrine?

A Yes. The purpose of the analysis was to define the amount of reduction in groundwater CBCU to achieve compliance, so it's the basic assumption that surface water use is going to continue.

Q And increase -- I'm just trying to reconcile what I perceive as an incongruity between the goal of reducing CBCU and then turning around and allowing surface water CBCU to increase at the expense of groundwater CBCU decreasing.

A Yes. If surface water use is occurring, then there's not really any way to go in and prevent slight increases in use as you change the pumping amount. I mean, surface water is either occurring or it's not.

Q But from a regulatory standpoint, it could be reduced, right? I mean, subject to the concerns you expressed earlier about the Bureau and state law?

A It's possible that it may be reduced, yes.

Q Or through a voluntary incentive program?

A Yes.

Q With regard to the second-to-the-last point here, have you performed any analyses that consider future compliance with the two-year water-short standard?

A No, I did not.

Q Do you know whether anyone on your team did that?

A I -- I'm not aware of it.

MR. WILMOTH: Why don't we take five minutes -- why don't we go to 2:35.

MR. DRAPER: Okay.

(Recess taken from 2:23 p.m. until 2:40 p.m.)

(At this time, Mr. Chris Grunewald is present in the deposition room.)

Q (BY MR. WILMOTH) Mr. Book, could you please refer to Section 3 of your report, the Book III of your report?

A Yes.

Q Page 3. And with regard to the use of the '95 to 2009 cycle to project the future scenarios, why did you elect to run that cycle four times?

A I don't know why it was done four times.

Q In Section 3.2 on page 4, the third sentence of that first paragraph indicates that the projection is necessary to account for increasing stream depletions due to past and expected future pumping.

Were you responsible for identifying the past pumping and the future pumping scenarios?

A No, I was not.

Q Do you know what the past pumping is as referred to in that sentence?

A Past pumping would be pumping prior to the present, and so that -- I think that's all of record, considered to be model input.

Q So that's all the pumping that has occurred through the period of record in the model?

A Through 2009, yes.

Q It's not a discrete band of --

A No.

Q -- years?

And is the projected future pumping the levels that Mr. Larson identified as inputs into the model?

A Yes.

Q Is that pumping assumption that Mr. Larson made consistent with the trend in pumping since 2002 in Nebraska?

A Yes. That's my understanding that it is, that they considered pumping levels through 2009 with consideration for the limitations in the plans.

Q And is that understanding based on your discussions with Mr. Larson?

A Yes.

Q And when I spoke to Mr. Larson yesterday about how the size of the relevant corridors were determined with respect to the pumping reduction area, I think I understood him to say that was a collaborative process. Were you involved in that process?

A I was involved indirectly. I was involved at the conceptual stage, that the corridor area would be used to provide the minimum amount of acreage reduction. As I mentioned, the post-2000 water rights for upland wells were removed from this analysis. I didn't -- I was not involved in the specific details of setting up the corridor, though.

Q Okay. So you didn't encourage the elimination of those upland wells you're referring to?

A I was part of the discussions to consider

removing those from the analysis.

Q And can you tell me again why they were removed? Is it because of this efficiency question that we spoke of earlier?

A Yes.

Q And further in the discussion, under 3.3.1, the description of the analysis, I understand that you've further reduced the groundwater CBCU to offset the increase in surface water CBCU that would have resulted from your initial reductions; is that right?

A That's generally correct, yes. As you reduce groundwater CBCU in this baseline period of '02 to '06, streamflows increase slightly, causing some increase in surface water CBCU, which ripples through the accounting, RRCA accounting.

Q Okay. Is that kind of a perpetual cycle? I mean, is it a -- does it feed on itself? In other words, you reduce a certain amount of groundwater CBCU and that results in an increase in surface water CBCU, and then you have to reduce groundwater further to offset that increase, et cetera, et cetera, et cetera?

A Yes. The fractions are small, though, so it's not dealing with large incremental shifts.

Q Okay. So that diminishes over time?

A Yes.

Q All right. And I'm sorry, I don't recall, but did you identify that volume of water that you were reducing in that way, or is that in the backup information that accompanies the report?

A That's in the backup information.

Q Okay. Is there anywhere in here that I could identify which backup information I should be looking at, or was that something that you could identify later?

A You can see the effect of it in a table, Table 2, where you compare the surface water CBCU under the actual '02 to '06 condition and then compare that to the same column under the adjusted condition with the reduced groundwater CBCU, and you see that the surface water CBCU increases from 53,000 acre-feet per year to 58,000 acre-feet per year.

Q Okay.

A There really isn't much backup beyond that. The relationship that we developed was used in this table to make the calculation.

Q Okay. And is that a function then of how the model produces a result based on those relationships?

A We developed a separate relationship to relate the change in groundwater CBCU to the change in

surface water CBCU, so that's independent of the groundwater model. But that relationship is applied in this table. It's a fairly simple relationship.

Q Is the nature of the relationship explained in the narrative?

A Yes.

Q Okay. Could you tell me where that is?

A That's described in Section 3.3.5 at the bottom of page 7 and the top of page 8.

Q Okay. So if I understand it then, the analysis part is in your backup data and the results are in the table?

A Yes.

Q Okay. And if we ask you to create that linkage for us, you could do that?

A Yes.

Q With regard to the assumptions listed on page 5 in Section 3.3.2, did Mr. Larson perform the analysis in Assumption No. 1?

A Yes.

Q And with regards to Assumptions 2 and 3, did these reflect that preference you referred to earlier for shutting down groundwater uses first and allowing the surface water uses to continue based on the Prior Appropriation Doctrine?

A Assumptions 2 and 3 basically describe how the changes in groundwater impacts were considered in the surface water uses. Implicit in that is the assumption that surface water use will continue.

Q And concerning that assumption, I think I understood you earlier to suggest that there were some limitations on Nebraska's ability to curtail surface water uses. In your view -- is that right, some legal limitations in your view?

A I don't know that I expressed legal limitations. I think the two points I mentioned were this being a federal project and there being senior water rights involved. I don't think I extended that to the next step of --

Q Could you tell me how you viewed those as limitations?

A That there would be a preference for managing the basin by maintaining the senior surface water projects and water rights.

Q So your limitation, in other words, is your assumption about how Nebraska would treat those rights?

A Yes.

Q In regard to Assumption No. 4, we've spoken again about this irrigation season definition. Can I assume that you defined the season as May through

September based on the historical information you previously referred to when we were discussing the matter under Book I report?

A Yes. The differences previously, that was related to the KBID operations, and now we have more canals that we're observing data for and we're looking at historical record on all these canals to reach that conclusion.

Q Okay. And you assume all the canals continue in operation throughout the period?

A The assumption we made was that a canal that was diverting for a given year could divert additional water, but if the canal was not diverting, that it did not divert additional water.

Q Am I correct then that you looked at the historical data and essentially replicated it under similar conditions in the future?

A Used it and added to it, is the way I would describe it.

Q What did you add to it?

A An incremental analysis. So the question is, if you have additional water, what's the -- what's the allocation of that water, and so it gets added to the historical use.

Q Okay. Does your projection assume any

particular variables, like precipitation patterns or crop type changes or anything like that, or is that projection based on those historical activities?

A It's based on the historic activities.

Q Getting into the reservoir operation Section 3.3.3 on page 5, and continuing onto page 6, at the top of page 6 you indicate that monthly evaporation rates were calculated based on historical data.

What historical data were you referring to there?

A We received -- or obtained the evaporation data from the Bureau of Reclamation. We have provided that in the backup files.

Q That's in the backup files?

A Yes.

Q Okay. And if we asked you to link those, could you do that for us?

A Yes.

Q And I've got a series of questions on this section that are in a similar vein. You explain that the additional evaporation was calculated by applying these rates to the changing reservoir area.

Is that calculation in the backup data?

A Yes.

Q And you could provide me the linkage if we

asked?

A Yes.

Q Okay. And then you note additional water was adjusted by the net change in evaporation. Same answer?

A Yes.

Q And a relationship was developed between releases and the distribution to downstream canals based on the historical release and diversion.

Same answer?

A Yes.

Q And a distribution percentage of diversion as a function of reservoir release was calculated.

Same answer?

A Yes.

Q How does that final assumption compare to the analyses in your Book I report?

A Which assumption are you referring to?

Q The distribution percentage of diversion as a function of reservoir release was calculated for each canal and applied to the available water in Harlan County Lake.

A That was an assumption to distribute the water to the various canals that used water out of Harlan County, so in addition to Kansas Bostwick, there

are Nebraska Bostwick canals involved.

Q Did you employ that assumption at all in Book I?

A No, we did not. All of the Nebraska overuse was computed to be delivered to Kansas.

Q Okay. Now, with regard to the canal operations under the demand section, again the monthly demand schedule was generated from historical diversion data.

Are we -- are we referring there to the same historical data that's in the backup information?

A Yes.

Q And that could be linked if we asked you to do so?

A Yes.

Q Okay. Now, in demands, I understand you used the maximum historical diversion as the monthly demand, is that right, where it says a seasonal max demand was applied to the canals?

A Yes. So we had two -- two demand levels. One was seasonal and one was monthly.

Q And why did you elect to use the maximum demands in that scenario, but in Book I when calculating the KBID return flow uses, you utilized the average historical use?

A That's -- the assumption here is that demands would occur up to levels that had occurred historically, and therefore, the seasonal demand was developed. In any particular month, it was allowed to go up to the maximum historical monthly. Typically, the seasonal demand would control if there was much water involved.

Q If you had applied an average demand, how would that affect your analysis?

A That would probably reduce the amount of water going to the canals and reduce the amount of increased surface water CBCU.

Q And with regard to the manner in which the seasonal max demand was developed, is that in the backup data?

A Yes, it is.

Q And you could give me that linkage if we asked?

A Yes.

Q Okay. Now, with regard to losses, you note that monthly data were used to develop relationships of losses to diversions.

How were those relationships developed?

A Just using the historical records from the Bureau of canal diversions and deliveries made by the

canals, and then we plotted monthly data and developed a relationship.

Q Is that reflected in the backup data?

A Yes, as well as in the graphs in the report, I believe. We plotted the loss.

Q Is this in one of the appendices?

A Yes.

Q Which appendix?

A Those are shown in Appendix A, starting on page 22 --

Q I see.

A -- showing the series of relationships. It goes on for three pages.

Q And then I understand the additional water supply computed to be available to the canals was added to the historical supply, right?

A Yes.

Q And the effect of that addition is shown in one of your tables; is that right?

A We have Appendix A-5, which shows changes in surface water CBCU that are summarized by year. We show additional diversions in Appendix A-3, again, summarized. And then the bottom-line results are shown in the Table 3, just the single number for surface water CBCU.

Q So can I tell from these tables directly what the additional supply was and what the historical supply was?

A These tables will tell you the changes, but not the historical.

Q Okay.

A That information --

Q That's the backup data?

A Yes.

Q Okay. And we can create those linkages?

A Yes. I do have a summary graph on Appendix A-4 which shows -- for groups of canals, compares the historical and adjusted diversions.

Q Okay. And the source of that is?

A The analysis that we developed.

Q Okay.

A It's a spreadsheet.

Q A little further down in this section you note that the system efficiency for the delivery of the additional supply was based on efficiency corresponding to the total.

What is the calculated efficiency that you came up with? This is at the top of page 7.

A Yes. The efficiency that I'm referring to there is the -- from those curves, and the applications

of these curves are made to the total supply, so it's the historical supply plus the additional supply.

That's what I'm referring to there when I say the total supply, and the system efficiency is basically the canal loss relationship off the graphs.

Q And the relationship as shown in that -- in the appendices --

A Yes.

Q -- that you referred to?

A Yes.

Q And the source of the appendices' data is the backup in the spreadsheets?

A That's correct.

Q Gotcha. And then after deducting the losses, the remaining supply deliverable to the farms was computed.

Where is that computation?

A That shows up in a spreadsheet. I don't have it itemized in the report tables.

Q So that's in -- we would look to the backup data to look at that?

A Yes.

Q And finally in this section, why did you assume that the recharge from return flows accrued to the stream at a steady state over 12 months?

A That was a simplifying assumption that was used to provide return flows back to the system from the Cinco Meadow water supply.

Q And is there a reason you didn't have that all returning during the irrigation season as in the Book I report?

A No particular reason. We didn't do the level of analysis of the systems in Nebraska that we had done for Kansas Bostwick. The systems in Nebraska tend to be more located along the river. Not entirely, but certainly more of the land in Nebraska is along the river alluvium than occurs in the KBID system.

Q Then midway down page 7, you indicate that a minimum diversion threshold was applied to the sum of the historical and additional canal supply.

Could you explain what that means to me?

A Yes. We were -- we were calculating diversions of incremental flows added to the stream from reduced pumping and in certain locations or in certain time steps, those could be quite small numbers.

And if they did not achieve a threshold level of diversion, then we did not simply run small amounts of water down the canal. In other words, if a canal was not operating, we were not going to add very small amounts to the canal because it would disappear

basically.

Q Be lost?

A Yes.

Q Why did you not apply any such threshold to the Courtland Canal?

A I don't recall specifically. I think during periods when we were diverting, the Courtland Canal was generally operating. I did -- I did not want this analysis to overstate the amount of Nebraska increased CBCU, so I probably went a little bit in the direction of making more of the water go to Kansas if there was water in this reach between Harlan County Reservoir and the Guide Rock diversion dam.

Q Okay. Now, on 3343, page 7, we're talking about the Superior and Courtland canals. You indicate that a monthly net impact was calculated by combining these impacts and return flows.

Is that work shown in your report?

A Yes.

Q Where is that?

A Pardon?

Q Where is that?

A In the analysis, we go through a canal-by-canal and a reach-by-reach operation for each of the reservoirs, and the return flow calculations are

identified in the spreadsheet as a series of columns which are combined.

I don't have that detailed in the report tables, but it's in the backup spreadsheet.

Q All right. And you could link those for us?

A Yes.

Q And you assume that the additional net impacts were used before water stored in Harlan County Lake; is that right?

A Yes.

Q And by "net impacts," what did you mean in that particular context?

A The net impacts in this paragraph are defined as the combined change in groundwater pumping impacts and the return flows generated from changes above Guide Rock between Harlan County and Guide Rock. So the two of those terms combined create flow changes in the reach below Harlan County. That's what's referred to in this paragraph.

Q So in perhaps lay terms, are you assuming that natural flow is used before stored water is used?

A Yes.

Q On what did you base that assumption?

A I think that's generally the way the system

operates, that the canals are going to use the water available in the stream before they release reservoir water up to their demand.

Q Did Mr. Ross help you formulate that opinion?

A No. That's my general understanding of the way the system operates.

Q Okay. And further down, in the last sentence, you note that gains that are not divertible due to timing or location accrue to the Hardy gage.

How do you identify those gains? Are they reflected in the report somewhere?

A Yes. It's a monthly time-step analysis, so the diversions are not occurring the entire year. So there's times when the gains are routed to the Hardy gage.

Q And is that volume of water associated with that phenomenon reflected in the report?

A I don't believe I have that in a specific table in the report. It's certainly a part of the backup analysis.

Q All right. Now, in 3.3.5, the results of the surface water analysis at the bottom of page 7?

A Yes.

Q You note that an analysis was made over a

range of changes in streamflow. What was the range that you used?

A We used a series of groundwater model results.

Q Is that shown in one of your tables?

A The various scenarios are listed in Appendix A-1 on page 17, and that lists a series of runs, which are referred to as either the 2-mile or 3-mile corridor and the various levels of reduction, four levels of reduction for each, and from which cycle the results were obtained.

And so that generated a series of runs, changes in the streamflow, which we then ran through this surface water analysis to develop our curve.

Q And all of these runs are on the backup material?

A Yes.

Q Finally, with regard to the results of your analysis and the conclusions, really, did you have any occasion or were you instructed at any point to consider the socioeconomic impacts of retiring 302,000 acres of groundwater irrigated area in Nebraska?

A No.

Q Have you had an opportunity to review the most recent RRCA accounting for the last five years?

A No, I have not.

Q Do you have any idea what Nebraska's current accounting balance is over that period?

A No, I don't.

Q Can you explain for me the -- in generic terms, the role that you played in providing information for the use in Mr. Barfield's report.

A I'm not sure that I can point to anything that I specifically provided. I completed this report at the time, and so this information was available. I can't think of anything specific that I contributed to that document.

Q And with regard to Drs. Hamilton and Robison, we've spoken a little bit about that role that your work has played in their work. Aside from identifying the likely irrigated acreage that would have been irrigated in '05 and '06, did Dr. Hamilton provide you any limiting instructions in your work?

A Are you asking in relation to the first report?

Q In relation to any of the three reports.

A Well, with relation to the first report, no. I can't think of anything in that category in the second report. I provided him quite a bit of information on the surface water supplies for those

years and which canals and which acreage would have had surface water removed.

He did not provide any limiting conditions. He just basically wanted to know how much water, how much acreage would be removed under these systems.

Q Have you had an occasion to review Dr. Hamilton's final report?

A I've seen it. I don't know that I would consider that a review of the report.

Q As far as you know, did Dr. Hamilton appropriately utilize the information you provided him?

A Yes.

Q In regards to coordinating with individuals in KBID to assist in developing your report, I understand you spoke with Mr. Nelson and with one other individual --

A Yes.

Q -- is that right?

Can you refresh my recollection on who the other individual was?

A I think I saw his name on an annual report you gave me. Don Lieb.

Q Can you recall generally the nature of the information that they provided to you, what categories of information?

A They provided a description of the operation of the District and the irrigation system, how they interact with the Bureau of Reclamation, how they would interact with their water users to deliver water. I think those are the main elements.

Q Did you find any of the information that they provided untrustworthy?

A No.

Q Aside from Mr. Barfield and the remaining members of your team of experts, was there anyone from the State of Kansas with whom you conferred, other than maybe Mr. Ross, to assist in the development of your reports?

A Well, some of the modeling runs and the interactions that we had on the model results were done with Sam Perkins. I believe he's a coauthor on the Larson report, so he was involved in coordination on model results. Beyond that, I can't think of anybody else.

Q Was there anyone else from Spronk Water Engineers that contributed materially to your report, other than the list of authors?

A Angela Schenk was involved in all three analyses and reports. That's it.

Q Was there any information you obtained from

either Mr. Ross or Mr. Perkins that you believed was untrustworthy?

A No.

Q And to clarify for the record, I don't mean to suggest that any of these individuals are untrustworthy; just that the information they might have provided you was suspect.

A Certainly went through a number of drafts of model results, iterations of model runs, so there's draft model runs that would not be used.

Q Okay. Did you coordinate directly with anyone from the Bureau of Reclamation in developing your reports?

A No, I did not.

Q Is there any data or information from the Bureau on which you relied but had concerns about its validity?

A No, not that I can think of.

Q Did you coordinate in any regard with any individuals in Nebraska, either the State of Nebraska or the Nebraska Natural Resources districts or individual irrigators within Nebraska in developing your analyses?

A No, I did not.

MR. WILMOTH: All right. Why don't we take another -- break until 3:35 again and, then we'll finish

up.

MR. DRAPER: Okay.

(Recess taken from 3:23 p.m. until 3:38 p.m.)

Q (BY MR. WILMOTH) Mr. Book, could you please refer to what we marked as Exhibit 11, which is the Glover spreadsheet.

A Okay.

Q And I would like to refer you to page 7. Can you tell me what the "Above KBID" category represents here in column D?

A Yes. To do that, I would refer to the map which is in our report, Appendix D-1, page 38.

Q Can you tell me which report you're referring to?

A This is in the Book I report.

Q And I'm sorry, one more time on the -- which map?

A There's a map on page 38, Appendix D-1.

Q Yes. Thanks.

A There is a series of green dots on here which are referring to centroids of various areas, and these should be distances from the various subbasins identified on the map to the nearest flowing stream.

And so the categories of Alluvium 1 -- 4, 1

and 3, I don't believe we identified them on the map, but they should be identified in the backup data, the GIS files. And then the other ones, I believe, are self-explanatory, and there's two Spring's and one White Rock Creek.

Q For sake of clarity, could I ask you to circle those points on the exhibit copy and just highlight for me which ones are Spring 1, 2 and White Rock.

A (The deponent complied.)

Q And can you indicate on there roughly where the Alluvium 1, 3 and 4 would be?

A I don't know which numbers. There are three alluviums, and I don't have the numbers on my maps. I'm not able to tell you which one corresponds to which.

Q Can you tell me generally -- could you just circle the area that they might be located in?

A (The deponent complied.) I've circled three centroids and alluvial areas. I just don't know which ones are the respective numbers.

Q I see. Thank you.

And can you tell me what this value is that's delineated as "Weighted X"? How did you calculate that 6,338 number and what does it represent?

A I believe that's the area weighted length. So if you -- we have a weighting percentage off to the right-hand column there. So if you assign that weight to each of those distances, it's just a simple weighted distance to use in the Glover formula.

Q And how do you then use that weighting or that weighted figure in the analysis?

A Those two parameters, the X and the W, are inputs to the Glover formula.

Q Okay. And do you know what the Glover formula does with those?

A It processes those through the formula to generate responses. That's a general statement.

Q Sure. But do you know -- are we -- are we trying to calculate a particular value?

A This is used to calculate the response of a given amount of return flow, what the timing is for that to reach the stream.

Q Okay. And when you computed the return flow, did you use a flow of length from the centroid that might be depicted on these maps and a point on the stream?

A Yes.

Q Okay. And was that just the line perpendicular to the stream?

A It is perpendicular to stream, that's correct.

Q Okay. And in your experience, does water always travel in that fashion?

A That's the general direction. It's not always the case that it's exactly perpendicular, but that's a good representation of the flow path.

Q Are there parts of that water that don't flow directly perpendicularly to the stream? Do they spread out or do they go down or do they go the other direction or do they go up sometimes?

A Water molecules are going to -- are going to travel differently, but the direction of flow is going to be downgradient.

Q Okay. So how do all those things affect the timing of return flow?

A Well, the distance is one of the key parameters, along with the aquifer parameter -- the aquifer property in the calculation of what the timing is. So the timing that you calculate is sensitive to the distance.

Q So in lay terms, what I'm trying to get at here is, did you assume that all the water traveled in the shortest distance from the centroid to the river?

A That's -- the effect of the flow and the

way the Glover formulation is set up is that's the distance that you consider is the flow -- the flow path distance from the centroid to the stream.

Q The shortest distance between the two points in a perpendicular line?

A Yes. That's the assumption that we made here.

Q Would you agree that many of the Glover relationships are not linear, they're not linear functions?

A I'm not sure I understand the question.

Q Are --

A Rephrase that.

Q Are most of the Glover relationships that you employed here linear functions?

A Well, that's the basic underlying assumption between unit response approach, is that you have a linear response of the aquifer.

Q And is that your understanding of how Glover operates?

A Yes.

Q Can I refer you to Table B-2 in your first Book report?

A Okay.

Q This is on, for clarity, page 31. I think

I might have said Table, but I meant Appendix B-2.

A Yes, I have that.

Q All right. Sorry. What does this table represent?

A This is basically a mass balance of May through September totals for the Courtland Canal between the headgate at Guide Rock and the stateline, also showing deliveries to the NBID lands, as well as the calculated loss in column 4.

Q Why were the data for 1996 removed?

A I don't recall.

Q Do you know how we might make that determination?

A I suspect there was some anomaly involved with that data.

Q Do you know what the source of the data were -- was?

A The sources of the data are indicated here. We're using the Bureau diversion records.

Q Okay. So there may have been some anomalous result in each of those data sets for 1996; is that what you're suggesting?

A That's a possibility, yes.

Q Okay.

A I don't recall exactly why we took that

out.

Q And let's move forward to Appendix C-1 for a moment. And in this case, 1996 was not removed.

Does this help you remember perhaps why it was removed in one case but not the other?

A No, it doesn't.

Q Okay. With respect to the value in Appendix C-1, in the far right column, under total, for the year 2000, why is that value so much higher than all of the other values?

A Well, the one -- the one thing that sticks out is a large March operation. There is also an above-average April operation. It's possible that was related to some issue with Lovewell Reservoir. I don't have any more information beyond that, but it definitely appears to result from those two months, March and April.

Q What kind of an operation would occur in March and April for Lovewell Reservoir?

A Well, that -- one thing that would explain that would be if there's capacity available in Lovewell that year that may not normally be there. That's one possibility. And I don't know what the cause of that would have been.

Q So can you just explain to me the dynamic

that would be represented here? Is water being brought out of the Harlan County Reservoir and being put into Lovewell Reservoir?

A I can't say that it was brought out of the Harlan County Reservoir. That could be water picked up in the river.

Q Okay. And this is all water in Courtland Canal at Stateline?

A Yes.

Q Okay. So there's something anomalous in that year, but we're just not sure what it is; is that right?

A I'm not sure. Correct.

Q I'd like to turn your attention to Appendix C-3 and C-4 -- Appendices C-3 and C-4. It seems to me that the inflows listed here to Lovewell in '98, '99 and 2000 are substantially less than the outflows for those same years.

First of all, do you agree with me on that? And secondly, do you have an opinion as to why that would occur?

A The question, as I understand it, relates to the outflow versus the inflow?

Q Yeah. I think the outflow seems to be about 45,000 acre-feet higher than the inflow, and I'm

trying to determine why that would be.

A Yes. I would assume those are wet years on White Rock Creek. At least 1998 and 1999 appear to be that way and that the -- a lot of the supply coming out of Lovewell would have been generated from White Rock Creek.

The inflow to Lovewell Reservoir is from Courtland Canal. I don't -- I don't see that same issue with the year 2000. I've got 62,000 in and 62,000 coming out.

Q True. That was one of the things that caused some confusion.

Is that to suggest then that, at least for those years, there was some kind of spill from Lovewell?

A That's possible. Yes. I mean, White Rock Creek could certainly cause spills.

Q A spill of flood water?

A Yes.

Q All right.

MR. WILMOTH: I think we are done then. If you want to take a few minutes and --

MR. DRAPER: Yeah. Okay.

(Recess taken from 3:58 p.m. until 4:09 p.m.)

MR. DRAPER: Mr. Ampe, do you have any

questions?

MR. AMPE: I do not.

MR. DRAPER: We have no questions.

MR. WILMOTH: That concludes it. Thank you, Mr. Book.

(Whereupon, the deposition concluded at 4:10 p.m.)

I, DALE BOOK, P.E., do hereby certify that I have read the foregoing transcript and that the same transcript and accompanying correction sheets, if any, constitute a true and complete record of my testimony.

_____
Deponent

[ ] No Changes [ ] Amendments attached

Subscribed and sworn to before me this

_____day of _____2012.

My commission expires:_____

_____
Notary Public

sd

State of Kansas v. State of Nebraska, et al.

STATE OF COLORADO)
)SS. REPORTER'S CERTIFICATE
COUNTY OF ARAPAHOE)

I, K. MICHELLE DITTMER, do hereby certify that I am a Registered Merit Reporter and Notary Public within the state of Colorado; that previous to the commencement of the examination, the deponent was duly sworn by me to testify to the truth.

I further certify that this deposition was taken in shorthand by me at the time and place herein set forth and was thereafter reduced to typewritten form, and that the foregoing constitutes a true and correct transcript.

I further certify that I am not related to, employed by, nor counsel of any of the parties or attorneys herein, nor otherwise interested in the result of the within action.

I further certify reading and signing not requested pursuant to CRCP Rule 30(e).

In witness whereof, I have affixed my signature this 27th day of February, 2012.

PATTERSON REPORTING & VIDEO
K. Michelle Dittmer
Registered Merit Reporter

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February 28, 2012

JOHN B. DRAPER, ESQ.
Montgomery & Andrews, PA
325 Paseo de Peralta
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Case Name: State of Kansas v. State of Nebraska, et al.
Case No.: No. 126, Original
Deposition of: DALE BOOK, P.E.

The deposition in the above-entitled matter is ready for reading and signing. Please attend to this matter by complying with ALL blanks checked below.

_XX_ arranging with us at (303) 696-7680 to read. and sign the deposition in our office.

OR (if applicable),

_XX_ have deponent read your copy; signing attached original signature page and any amendments sheets.

____ read enclosed deposition, sign attached signature page and any amendment sheets.

_XX_ within 30 days of the date of this letter.

Please be sure that the signature page and accompanying amendment sheets, if any, are signed before a notary public and returned to our office at the above address.

If this matter has not been taken care of within said period of time, the deposition will be filed unsigned pursuant to the Rules of Civil Procedure.

Thank you.
Enclosures:
cc: Tom Wilmoth, Esq; Peter J. Ampe, Esq.

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February 28, 2012

TOM WILMOTH, ESQ.
Blankenau Wilmoth LLP
206 South 13th Street, Suite 1425
Lincoln, Nebraska 68508

Re: State of Kansas v. State of Nebraska, et al.
Deposition of: DALE BOOK, P.E.

Dear Mr. Wilmoth:

____Previously filed. Forwarding signature page and amendment sheet(s).

____Signed, no changes.

____Signed, with changes, copy of which is enclosed.

____No signature required.

_XX_Reading and signing not requested pursuant to CRCP Rule 30(e)

____Signature waived.

_XX_Forwarding original transcript unsigned; signature page and/or amendments will be forwarded if received.

____Original exhibits included in ongoing notebook and will be filed with counsel at conclusion of discovery.

Enclosures: (As above noted)
cc: John B. Draper, Esq.; Peter J. Ampe, Esq.